



## Repair Manual Jetta 2011 ➤

**4-Cylinder Fuel Injection Engine (2.0L Engine, EA  
888, Chain Drive)**

|           |          |          |  |  |  |  |  |  |  |
|-----------|----------|----------|--|--|--|--|--|--|--|
| Engine ID | CBF<br>A | CCT<br>A |  |  |  |  |  |  |  |
|-----------|----------|----------|--|--|--|--|--|--|--|

Edition 11.2018



## List of Workshop Manual Repair Groups

### Repair Group

- 00 - General, Technical Data
- 10 - Engine Assembly
- 13 - Crankshaft, Cylinder Block
- 15 - Cylinder Head, Valvetrain
- 17 - Lubrication
- 19 - Cooling System
- 21 - Turbocharger, Supercharger
- 24 - Multiport Fuel Injection
- 26 - Exhaust System, Emission Controls
- 28 - Ignition/Glow Plug System

Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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## Contents

|  |           |
|--|-----------|
| <b>00 - General, Technical Data</b>                            | <b>1</b>  |
| <b>1 Safety Precautions</b>                                    | <b>1</b>  |
| 1.1 Safety Precautions when Working on Fuel Supply System      | 1         |
| 1.2 Safety Precautions during Road Test with Testing Equipment | 1         |
| 1.3 Safety Precautions when Working on Cooling System          | 2         |
| 1.4 Safety Precautions when Working on Ignition System         | 2         |
| <b>2 Identification</b>  | <b>3</b>  |
| 2.1 Engine Number/Engine Specifications                        | 3         |
| <b>3 Repair Information</b>                                    | <b>5</b>  |
| 3.1 Guidelines for Clean Working Conditions                    | 5         |
| 3.2 Foreign Objects in Engine                                  | 5         |
| 3.3 Contact Corrosion  | 5         |
| 3.4 Line Routing and Securing                                  | 5         |
| 3.5 Radiator and Condenser Assembly                            | 6         |
| <b>10 - Engine Assembly</b>                                    | <b>7</b>  |
| <b>1 Engine, Removing and Installing</b>                       | <b>7</b>  |
| 1.1 Engine, Removing   | 7         |
| 1.2 Engine and Transmission, Separating                        | 17        |
| 1.3 Engine, Securing to Engine and Transmission Holder         | 18        |
| 1.4 Engine, Installing   | 19        |
| <b>2 Subframe Mount</b>  | <b>22</b> |
| 2.1 Overview - Subframe Mount                                  | 22        |
| 2.2 Engine Mount, Removing and Installing                      | 24        |
| 2.3 Engine, Supporting in Installation Position                | 29        |
| 2.4 Subframe Mount, Adjusting                                  | 33        |
| 2.5 Subframe Mount, Checking Adjustment                        | 36        |
| <b>3 Engine Cover</b>  | <b>37</b> |
| 3.1 Engine Cover, Removing and Installing                      | 37        |
| <b>4 Special Tools</b>   | <b>38</b> |
| <b>13 - Crankshaft, Cylinder Block</b>                         | <b>42</b> |
| <b>1 Cylinder Block, Belt Pulley Side</b>                      | <b>42</b> |
| 1.1 Overview - Ribbed Belt Drive                               | 42        |
| 1.2 Ribbed Belt, Removing and Installing                       | 45        |
| 1.3 Ribbed Belt Tensioner, Removing and Installing             | 46        |
| 1.4 Vibration Damper, Removing and Installing                  | 49        |
| 1.5 Vibration Damper Seal, Replacing                           | 51        |
| 1.6 Sub-Assembly Bracket, Removing and Installing              | 52        |
| <b>2 Cylinder Block, Transmission Side</b>                     | <b>56</b> |
| 2.1 Overview - Cylinder Block, Transmission Side               | 56        |
| 2.2 Flywheel, Removing and Installing                          | 58        |
| 2.3 Sealing Flange, Removing and Installing, Transmission Side | 60        |
| <b>3 Crankshaft</b>  | <b>68</b> |
| 3.1 Overview - Crankshaft                                      | 68        |
| 3.2 Crankshaft Dimensions                                      | 70        |
| 3.3 Main Bearing Shells Allocation                             | 71        |
| 3.4 Crankshaft Needle Bearing, Replacing                       | 72        |
| 3.5 Crankshaft, Measuring Axial Clearance                      | 74        |
| 3.6 Crankshaft, Measuring Radial Clearance                     | 74        |
| 3.7 Sensor Wheel, Removing and Installing                      | 75        |
| <b>4 Pistons and Connecting Rod</b>                            | <b>77</b> |



|           |  |            |
|-----------|--|------------|
| 4.1       | Overview - Piston and Connecting Rod .....   | 77         |
| 4.2       | Piston and Cylinder Bore, Checking .....   | 79         |
| 4.3       | New Connecting Rod, Separating .....   | 82         |
| <b>5</b>  | <b>Special Tools .....</b>   | <b>83</b>  |
| <b>15</b> | <b>Cylinder Head, Valvetrain .....</b>   | <b>88</b>  |
| <b>1</b>  | <b>Cylinder Head .....</b>   | <b>88</b>  |
| 1.1       | Overview - Cylinder Head .....   | 88         |
| 1.2       | Cylinder Head, Removing and Installing .....   | 92         |
| 1.3       | Vacuum Pump, Removing and Installing .....   | 111        |
| 1.4       | Compression, Checking .....  | 112        |
| <b>2</b>  | <b>Timing Chain Cover .....</b>  | <b>114</b> |
| 2.1       | Overview - Timing Chain Cover .....  | 114        |
| 2.2       | Upper Timing Chain Cover, Removing and Installing .....  | 117        |
| 2.3       | Lower Timing Chain Cover, Removing and Installing .....  | 118        |
| <b>3</b>  | <b>Chain Drive .....</b>   | <b>125</b> |
| 3.1       | Overview - Camshaft Timing Chains .....  | 125        |
| 3.2       | Overview - Balance Shaft Drive Chain .....   | 127        |
| 3.3       | Camshaft Timing Chain, Removing and Installing .....   | 130        |
| 3.4       | Balance Shaft Drive Chain, Removing and Installing .....   | 146        |
| 3.5       | Intake Camshaft Balance Shaft, Removing and Installing .....                                       | 149        |
| 3.6       | Exhaust Camshaft Balance Shaft, Removing and Installing .....                                      | 152        |
| 3.7       | Valve Timing, Checking .....   | 155        |
| <b>4</b>  | <b>Valvetrain .....</b>  | <b>157</b> |
| 4.1       | Overview - Valvetrain .....  | 157        |
| 4.2       | Camshaft, Measuring Axial Clearance .....  | 159        |
| 4.3       | Camshaft, Removing and Installing .....  | 160        |
| 4.4       | Camshaft Adjustment Valve 1 N205, Removing and Installing .....                                    | 169        |
| 4.5       | Valve Stem Seals, Removing and Installing .....  | 170        |
| <b>5</b>  | <b>Intake and Exhaust Valves .....</b>   | <b>176</b> |
| 5.1       | Valve Dimensions .....   | 176        |
| 5.2       | Valve Guides, Checking .....   | 176        |
| <b>6</b>  | <b>Special Tools .....</b>   | <b>178</b> |
| <b>17</b> | <b>Lubrication .....</b>   | <b>189</b> |
| <b>1</b>  | <b>Oil Pan/Oil Pump .....</b>  | <b>189</b> |
| 1.1       | Overview - Oil Pan/Oil Pump .....  | 189        |
| 1.2       | Engine Oil .....   | 193        |
| 1.3       | Oil Pan Lower Section, Removing and Installing .....   | 194        |
| 1.4       | Oil Pan Upper Section, Removing and Installing .....   | 197        |
| 1.5       | Oil Pump, Removing and Installing .....  | 202        |
| <b>2</b>  | <b>Crankcase Ventilation .....</b>   | <b>205</b> |
| 2.1       | Oil Separator, Removing and Installing .....   | 205        |
| <b>3</b>  | <b>Oil Filter/Oil Pressure Switch .....</b>  | <b>206</b> |
| 3.1       | Overview - Oil Filter Housing / Oil Pressure Switch F1 .....                                       | 206        |
| 3.2       | Overview - Oil Filter Housing / Oil Pressure Switch F22 and Reduced Oil Pressure Switch F378 ..... | 208        |
| 3.3       | Engine Oil Cooler, Removing and Installing .....   | 210        |
| 3.4       | Oil Pressure and Oil Pressure Switch F1, Checking .....  | 211        |
| 3.5       | Oil Pressure and Reduced Oil Pressure Switch F378, Checking .....                                  | 213        |
| 3.6       | Oil Pressure Switch F22, Removing and Installing .....   | 215        |
| 3.7       | Reduced Oil Pressure Switch F378, Removing and Installing .....                                    | 217        |
| 3.8       | Oil Pressure Regulation Valve N428, Removing and Installing .....                                  | 218        |
| <b>4</b>  | <b>Special Tools .....</b>   | <b>220</b> |





|  |            |
|--|------------|
| <b>19 - Cooling System</b>   | <b>223</b> |
| <b>1 Coolant System/Coolant</b>                                      | <b>223</b> |
| 1.1 Connection Diagram - Coolant Hoses                               | 223        |
| 1.2 Cooling System, Checking for Leaks                               | 224        |
| 1.3 Coolant, Draining and Filling                                    | 226        |
| <b>2 Coolant Pump/Coolant Thermostat</b>                             | <b>231</b> |
| 2.1 Overview - Coolant Pump/Coolant Thermostat                       | 231        |
| 2.2 Overview - Electric Coolant Pump                                 | 233        |
| 2.3 Electric Coolant Pump, Removing and Installing                   | 234        |
| 2.4 Coolant Pump, Removing and Installing                            | 235        |
| 2.5 Coolant Thermostat, Removing and Installing                      | 237        |
| 2.6 Coolant Pump Toothed Belt, Removing and Installing               | 241        |
| 2.7 Coolant Pump Drive Gear Sealing Ring, Replacing                  | 243        |
| 2.8 Engine Coolant Temperature Sensor G62, Removing and Installing   | 245        |
| <b>3 Coolant Pipes</b>   | <b>249</b> |
| 3.1 Overview - Coolant Pipes   | 249        |
| 3.2 Front Coolant Pipes, Removing and Installing                     | 250        |
| 3.3 Small Coolant Pipe, Removing and Installing                      | 253        |
| <b>4 Radiator/Radiator Fan</b>                                       | <b>255</b> |
| 4.1 Overview - Radiator/Radiator Fan                                 | 255        |
| 4.2 Radiator, Removing and Installing                                | 257        |
| 4.3 Fan Shroud with Radiator Fan, Removing and Installing            | 259        |
| 4.4 Radiator Fan V7 and Radiator Fan 2 V177, Removing and Installing | 261        |
| <b>5 Special Tools</b>   | <b>262</b> |
| <b>21 - Turbocharger, Supercharger</b>                               | <b>266</b> |
| <b>1 Turbocharger</b>  | <b>266</b> |
| 1.1 Overview - Turbocharger  | 266        |
| 1.2 Turbocharger, Removing and Installing                            | 272        |
| 1.3 Turbocharger Vacuum Diaphragm, Checking                          | 279        |
| 1.4 Turbocharger Vacuum Diaphragm, Replacing                         | 280        |
| <b>2 Charge Air System</b>   | <b>283</b> |
| 2.1 Schematic Overview - Charge Air System                           | 283        |
| 2.2 Overview - Charge Air System                                     | 283        |
| 2.3 Charge Air Cooler, Removing and Installing                       | 284        |
| 2.4 Charge Air System, Checking for Leaks                            | 287        |
| <b>3 Special Tools</b>   | <b>291</b> |
| <b>24 - Multiport Fuel Injection</b>                                 | <b>293</b> |
| <b>1 Injection System</b>  | <b>293</b> |
| 1.1 Component Location Overview - Injection System                   | 293        |
| 1.2 High Fuel Pressure, Reducing                                     | 299        |
| <b>2 Fuel Injectors</b>  | <b>301</b> |
| 2.1 Fuel Injectors, Removing and Installing                          | 301        |
| 2.2 Fuel Injector Seals, Replacing                                   | 305        |
| 2.3 Fuel Injectors, Cleaning   | 308        |
| <b>3 Air Filter</b>  | <b>310</b> |
| 3.1 Overview - Air Filter Housing                                    | 310        |
| 3.2 Air Filter Housing, Removing and Installing                      | 312        |
| 3.3 Air Filter Element, Removing and Installing                      | 314        |
| <b>4 Intake Manifold</b>   | <b>316</b> |
| 4.1 Overview - Intake Manifold                                       | 316        |
| 4.2 Intake Manifold with Fuel Rail, Removing and Installing          | 319        |



|   |  |            |
|---|--|------------|
| 4.3   | Throttle Valve Control Module J338, Removing and Installing .....          | 327        |
| 4.4   | Throttle Valve Control Module J338, Cleaning .....                         | 329        |
| 4.5   | Variable Intake Manifold, Checking .....                                   | 330        |
| <b>5</b>  | <b>Sensors .....</b>   | <b>333</b> |
| 5.1   | Fuel Pressure Sensor G247, Removing and Installing .....                   | 333        |
| 5.2   | Fuel Pressure Sensor G247, Checking .....                                  | 334        |
| 5.3   | Mass Airflow Sensor, Removing and Installing .....                         | 337        |
| <b>6</b>  | <b>Engine Control Module .....</b>   | <b>340</b> |
| 6.1   | Engine Control Module J623, Removing and Installing .....                  | 340        |
| <b>7</b>  | <b>High Pressure Pump .....</b>  | <b>343</b> |
| 7.1   | Overview - High Pressure Pump .....  | 343        |
| 7.2   | Overview - Fuel Rail with Fuel Injectors .....                             | 345        |
| 7.3   | High Pressure Pump, Removing and Installing .....                          | 347        |
| <b>8</b>  | <b>Special Tools .....</b>   | <b>351</b> |
| <b>26 - Exhaust System, Emission Controls .....</b> |  | <b>354</b> |
| <b>1</b>  | <b>Exhaust Pipes/Mufflers .....</b>  | <b>354</b> |
| 1.1   | Overview - Muffler .....   | 354        |
| 1.2   | Front Exhaust Pipe, Removing and Installing .....                          | 357        |
| 1.3   | Exhaust Pipes/Mufflers, Disconnecting .....                                | 360        |
| 1.4   | Exhaust System, Installing without Tension .....                           | 361        |
| 1.5   | Exhaust System, Checking for Leaks .....                                   | 363        |
| <b>2</b>  | <b>Secondary Air System .....</b>  | <b>364</b> |
| 2.1   | Overview - Secondary Air Injection System .....                            | 364        |
| 2.2   | Secondary Air Injection Pump Motor V101, Removing and Installing .....     | 364        |
| 2.3   | Secondary Air Injection Solenoid Valve N112, Removing and Installing ..... | 365        |
| <b>3</b>  | <b>Special Tools .....</b>   | <b>367</b> |
| <b>28 - Ignition/Glow Plug System .....</b>         |  | <b>368</b> |
| <b>1</b>  | <b>Ignition System .....</b>   | <b>368</b> |
| 1.1   | Overview - Ignition System .....   | 368        |
| 1.2   | Test Data and Spark Plugs .....  | 370        |
| 1.3   | Ignition Coils with Power Output Stages, Removing and Installing .....     | 371        |
| 1.4   | Knock Sensor 1 G61, Removing and Installing .....                          | 373        |
| 1.5   | Engine Speed Sensor G28, Removing and Installing .....                     | 374        |
| <b>2</b>  | <b>Special Tools .....</b>   | <b>376</b> |
| <b>3</b>  | <b>Revision History .....</b>  | <b>377</b> |



## 00 – General, Technical Data

### 1 Safety Precautions

(Edition 11.2018)

⇒ [P1.1 recautions when Working on Fuel Supply System", page 1](#)

⇒ [P1.2 recautions during Road Test with Testing Equipment", page 1](#)

⇒ [P1.3 recautions when Working on Cooling System", page 2](#)

⇒ [P1.4 recautions when Working on Ignition System", page 2](#)

#### 1.1 Safety Precautions when Working on Fuel Supply System

##### WARNING

There is a risk of injury due to the fuel being under pressure.

The fuel system is under pressure. Injuries are possible from fuel spraying out.

Before opening the fuel system:

- Wear protective eyewear.
- Wear safety gloves.
- Reduce the pressure: place clean cloths around the connection point and carefully open the connection point.

Procedure for reducing the high fuel pressure. Refer to ⇒ [F1.2 uel Pressure, Reducing", page 299](#) .

##### WARNING

Any type of fuel leak will result in an increased risk of fire.

Do not turn on the ignition, open the front doors, or attempt to start the engine at any time while any part of the vehicle's fuel system is unassembled. Failing to heed this warning could result in fire and personal injury

- Before opening the fuel system, interrupt the power supply to the fuel pump.

#### 1.2 Safety Precautions during Road Test with Testing Equipment

##### WARNING

There is A risk of Injury Caused by Unsecured Testing Equipment.

If the front passenger airbag deploys during an accident, unsecured testing equipment becomes a dangerous projectile.

- Secure the testing equipment on the rear seat.

or



- Have a second person operate the testing equipment on the rear seat.

### 1.3 Safety Precautions when Working on Cooling System

#### **WARNING**

##### **Risk of Scalding Due to Hot Coolant**

The cooling system is under pressure when the engine is warm. Risk of scalding due to hot steam and hot coolant.

- Wear safety gloves.
- Wear protective eyewear.
- Reduce the pressure by covering the coolant expansion tank cap with a cloth and carefully opening it.

### 1.4 Safety Precautions when Working on Ignition System

#### **DANGER**

##### **Risk of Injury Due to Electrocution**

When the engine is running the ignition system is under high-voltage. It is possible to be electrocuted by touching the ignition system.

- Never touch or remove the ignition wires when the engine is running or at starting speed.

#### **CAUTION**

##### **Risk of Damaging the Components.**

Washing the engine as well as connecting and disconnecting electrical wires when the engine is running can damage components.

- Switch off the ignition before connecting and disconnecting electrical wires.
- Switch off the ignition before washing the engine.



## 2 Identification

⇒ **N2.1 umber/Engine Specifications", page 3**

### 2.1 Engine Number/Engine Specifications

- ◆ The engine number ("engine code" and "serial number") are located at the front of the engine/transmission joint.
- ◆ There is also a label located on the upper timing chain cover with the "engine code" and "serial number".
- ◆ The engine codes are also located on the vehicle data label.
- ◆ The vehicle data label is located in both the customer maintenance schedule and on the vehicle rear in the spare tire well or on the luggage compartment floor.
- ◆ The engine number consists of up to nine characters (alphanumeric).
- ◆ The first part (maximum four letters) represents the "engine code", the second part (six digit) is the "serial number".
- ◆ If more than 999,999 engines with the same engine code are produced, the first of the six digits is replaced with a letter.

#### Vehicles with Four-Digit Engine Codes

- ◆ Four-letter engine codes beginning with "C" are used.
- ◆ The first three letters describe the mechanical engine structure and are still stamped on the engine, as before.
- ◆ The fourth letter describes the engine torque and output and is dependent on the Engine Control Module.
- ◆ The four-digit engine code is on the type plate, the vehicle data label and the Engine Control Module.



#### Note

*Vehicles for some countries do not have a type plate. Vehicle data label and type plate locations. Refer to ⇒ Maintenance; Booklet 20.1.*

| Engine Codes                       |                | CBFA           | CCTA           |
|------------------------------------|----------------|----------------|----------------|
| Emissions values                   | Standard       | SULEV          | ULEV 2         |
| Displacement                       | liters         | 2.0            | 2.0            |
| Output                             | kW at RPM      | 147/5100       | 147/5100       |
| Torque                             | Nm at RPM      | 280/1700       | 280/1700       |
| Bore                               | Diameter in mm | 82.5           | 82.5           |
| Stroke                             | mm             | 92.8           | 92.8           |
| Compression ratio                  |                | 9.6:1          | 9.6:1          |
| Valves per cylinder                |                | 4              | 4              |
| Research Octane Number (RON)       |                | minimum 95     | minimum 95     |
| Fuel injection and ignition system |                | FSI            | FSI            |
| Ignition sequence                  |                | 1-3-4-2        | 1-3-4-2        |
| OBD                                |                | yes            | yes            |
| Knock Sensors (KS)                 |                | 1 Knock sensor | 1 Knock sensor |
| Catalytic Converter                |                | yes            | yes            |
| Oxygen sensor regulation           |                | 3 sensors      | 2 sensors      |



| Engine Codes                    | CBFA         | CCTA         |
|---------------------------------|--------------|--------------|
| Exhaust Gas Recirculation (EGR) | no           | no           |
| Turbocharger, Supercharger      | Turbocharger | Turbocharger |
| Variable intake manifold        | yes          | yes          |
| Variable valve timing           | yes          | yes          |
| Secondary Air Injection System  | yes          | no           |
| Valves per cylinder             | 4            | 4            |
| Oil Pressure Control            | no           | no           |



### 3 Repair Information

⇒ [f3.1 or Clean Working Conditions", page 5](#)

⇒ [O3.2 bjects in Engine", page 5](#)

⇒ [C3.3 orrosion", page 5](#)

⇒ [R3.4 outing and Securing", page 5](#)

⇒ [a3.5 nd Condenser Assembly", page 6](#)

#### 3.1 Guidelines for Clean Working Conditions

When working on the fuel supply/injection system, pay careful attention to the following "5 rules" of cleanliness:

- ◆ Thoroughly clean the connection points and the surrounding area before loosening.
- ◆ Place the removed parts on a clean surface and cover them. Only use lint-free cloths.
- ◆ Carefully cover or seal opened components if the repair is not performed immediately.
- ◆ Only install clean parts: remove the replacement parts from their packaging just before installing them. Do not use parts that have been loosely stored or unpackaged (for example, in tool boxes etc.).
- ◆ Do not work with compressed air when the system is open. Do not move the vehicle.
- ◆ Make sure no fuel gets onto the fuel hoses. If necessary, the fuel hoses must be cleaned again immediately.
- ◆ Protect any disconnected connectors from dirt and moisture, and only connect them when they are completely dry.

#### 3.2 Foreign Objects in Engine

Any open intake or exhaust channels must be sealed with plugs whenever working on the engine to prevent contaminants from entering it.

#### 3.3 Contact Corrosion

Contact corrosion can occur if incorrect fasteners (bolts, nuts, washers, etc.) are used.

For this reason, only connecting elements with a special surface coating are installed.

In addition, rubber or plastic parts and adhesives are made of non-conductive materials.

If there are doubts about whether the parts are suitable, then use new parts. Refer to the Parts Catalog.

#### 3.4 Line Routing and Securing

- ◆ Mark the individual fuel, hydraulic and vacuum lines, the EVAP system lines or the electrical wires before disconnecting and/or removing them. This will prevent a mix-up when reconnecting them and will ensure the original installation location is kept.
- ◆ If necessary, draw sketches or take pictures.



- ◆ Due to the limited space inside the engine compartment, allow sufficient clearance to all moving or hot parts to avoid damaging the lines.

### **3.5 Radiator and Condenser Assembly**

When assembled correctly, the radiator, condenser and turbo-charger may have slight impressions on their plates. This is not damage. Do not replace the cooler, condenser or turbocharger because of impressions like that.





## 10 – Engine Assembly

### 1 Engine, Removing and Installing

⇒ [R1.1 removing", page 7](#)

⇒ [a1.2 nd Transmission, Separating", page 17](#)

⇒ [S1.3 securing to Engine and Transmission Holder", page 18](#)

⇒ [I1.4 installing", page 19](#)

#### 1.1 Engine, Removing

##### Special tools and workshop equipment required

- ◆ Tensioning Strap -T10038-
- ◆ Locking Pin -T10060A-
- ◆ Engine/Gearbox Jack - Engine Support -T10359A-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Torque Wrench 1332 40-200Nm -VAG1332-
- ◆ Engine and Gearbox Jack -VAS6931-
- ◆ Step Ladder -VAS5085-
- ◆ Engine Bung Set -VAS6122-
- ◆ Drip Tray for VAG1202A -VAG1306- or Shop Crane - Drip Tray -VAS6208-
- ◆ Spring Clip Pliers
- ◆ Cable Tie (not illustrated)

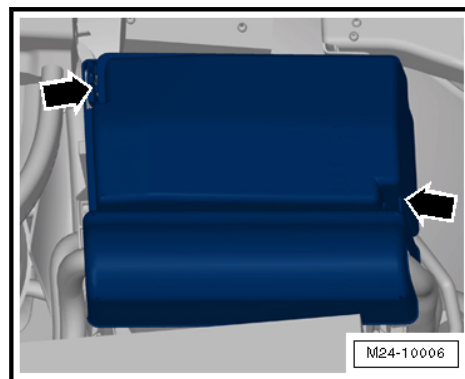


##### Note

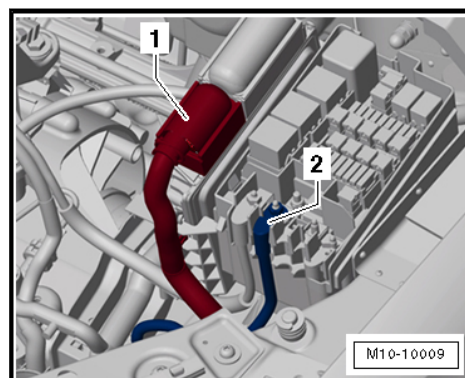
- ◆ *The battery ground cable must be disconnected for the following procedure. Therefore, it must be determined whether a coded radio is installed. Get the anti-theft code beforehand, if necessary.*
- ◆ *The engine is removed downward together with the transmission.*
- ◆ *All cable ties, that are opened or cut open when removing the engine, must be replaced in the same position when installing the engine.*
- ◆ *Seal off any disconnected fuel, vent and vacuum lines to prevent dirt from getting into the system.*
- ◆ *Leave the ignition key in the ignition lock to prevent the steering wheel lock from engaging.*
- Check the DTC memory for all control modules before removing using the Vehicle Diagnostic Tester in "Vehicle OBD".
- Remove the engine cover. Refer to [⇒ C3.1 over, Removing and Installing", page 37](#) .
- Remove the air filter. Refer to [⇒ F3.2 filter Housing, Removing and Installing", page 312](#) .



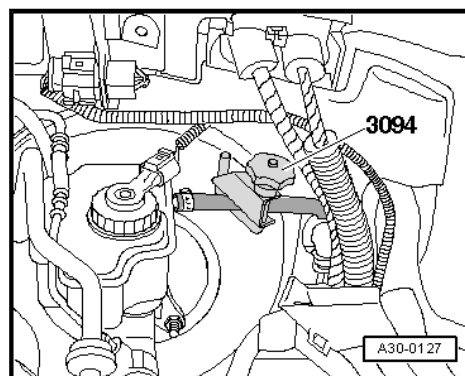
- Remove the battery and the battery tray. Refer to ⇒ Electrical Equipment; Rep. Gr. 27; Battery; Battery Tray, Removing and Installing.
- If equipped, remove the charge air guide to the sound generator.
- Remove the E-box cover inside the engine compartment -arrows-.



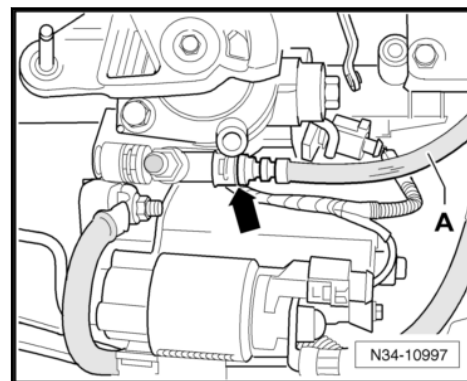
- Disconnect the line -2- and free it up.



- Disconnect the connector -1- from the engine control module and free up the wiring harness to the engine. Refer to ⇒ [E6.1 ngine Control Module J623, Removing and Installing](#), page 340 .
- Remove the selector mechanism from the transmission. Refer to ⇒ Rep. Gr. 34; Selector Mechanism; Selector Mechanism, Removing and Installing.
- Clamp off the hose to the master cylinder using the Hose Clamps - Up To 25mm -3094-.



- Pull the clamp -arrow- for the pipe -A- out as far as the stop.



- Pull the pipe -A- out of the bleeder/slave cylinder and seal it off.

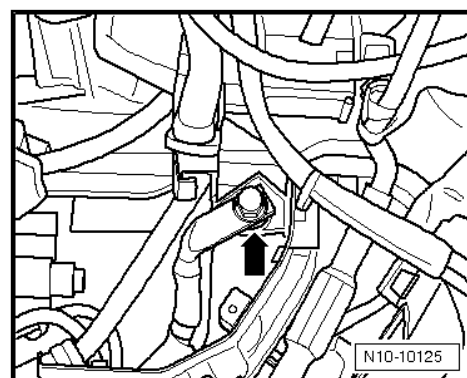
Do not operate clutch pedal any more.

#### Vehicles with DSG® Transmission

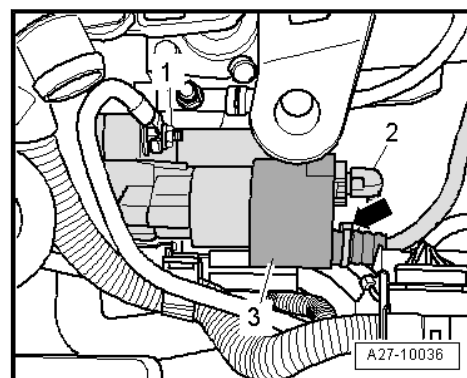
- Remove the selector lever cable from the transmission.  
Refer to ⇒ 6-Speed Dual Clutch Transmission 02E; Rep. Gr. 34; Selector Mechanism.

#### Continuation for All Vehicles

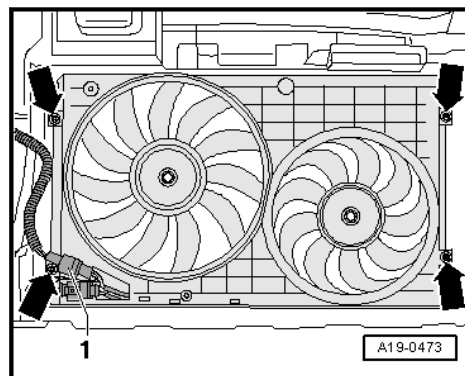
- Disconnect the ground wire on the longitudinal member -arrow-.



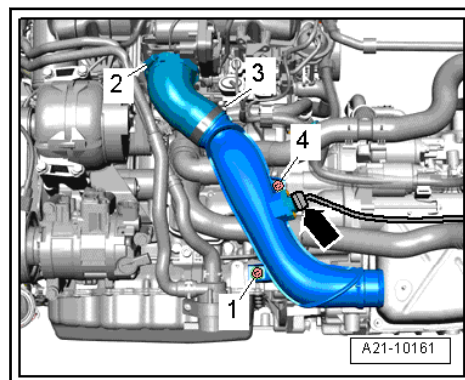
- Disconnect the connector -2-.



- Remove the upper bolts for the fan shroud -arrows-.



- Loosen the hose clamp -2-.

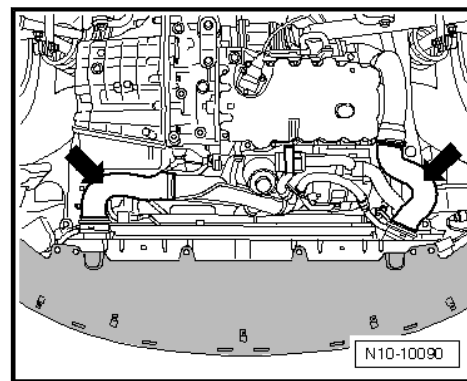


- Remove the bolt -4-.
- Disconnect the connector -arrow- and free up the wire.

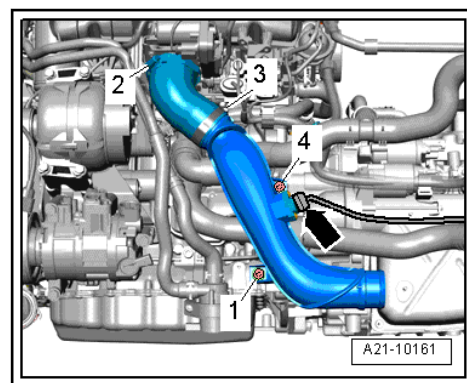
**⚠ WARNING**

The cooling system is under pressure when the engine is warm. Risk of scalding due to hot steam and hot coolant. Scalding the skin and other parts of the body is possible.

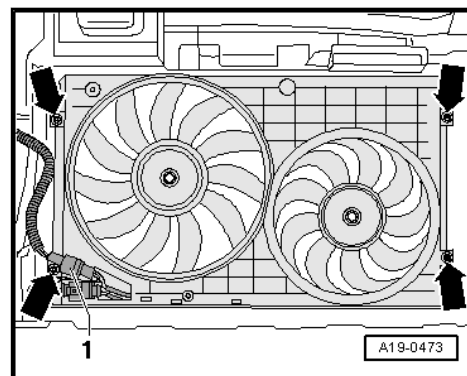
- Wear safety gloves.
  - Wear protective eyewear.
  - Reduce the pressure by covering the coolant expansion tank cap with a cloth and carefully opening it.
- 
- Open the coolant expansion tank cap.
  - Remove front wheels.
  - Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50; Noise Insulation.
  - Remove the front section of the wheel housing liners or remove the front wheel housing liners. Refer to ⇒ Body Exterior; Rep. Gr. 66; Wheel Housing Liner; Front Wheel Housing Liner, Removing and Installing.
  - Remove the charge air hoses -arrows-.



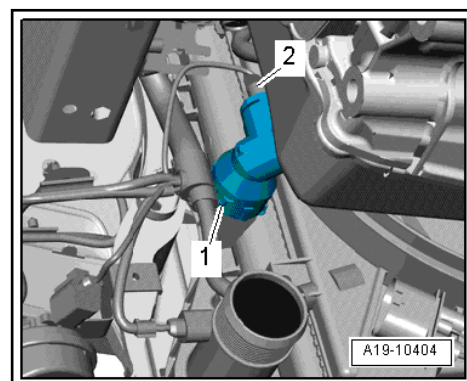
- Remove the bolt -1- and remove the air duct pipe downward.



- Disconnect the connector -1- and remove the lower bolts -arrows- for the fan shroud.



- Remove the fan shroud downward.
- Disconnect the connector -2- for the Engine Coolant Temperature Sensor on Radiator Outlet -G83-.

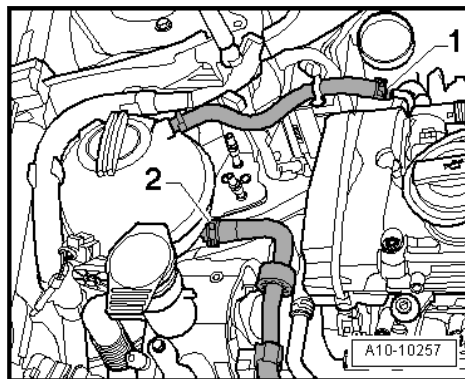




### Note

*Drained coolant must be stored in a clean container for disposal or reuse.*

- Place a Drip Tray for VAG1202A -VAG1306- or Shop Crane - Drip Tray -VAS6208- under the engine.
- Drain the coolant. Refer to [⇒ D1.3 draining and Filling](#), page 226 .
- Remove the coolant hoses -1 and 2-.

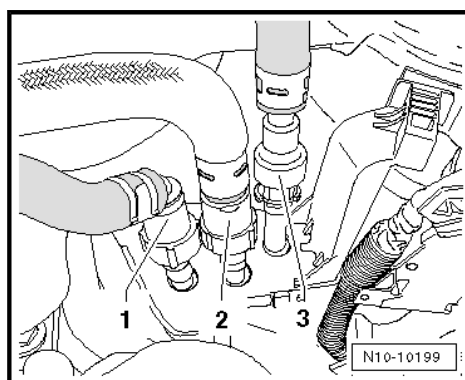


### WARNING

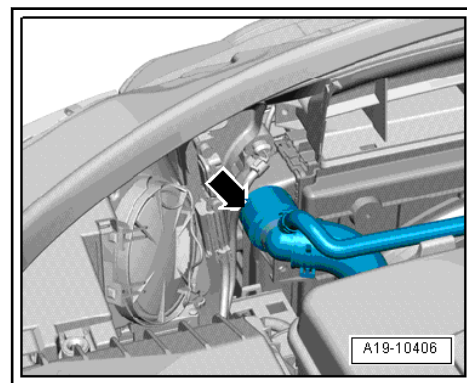
The fuel system is under pressure.

Risk of injury from fuel spraying out.

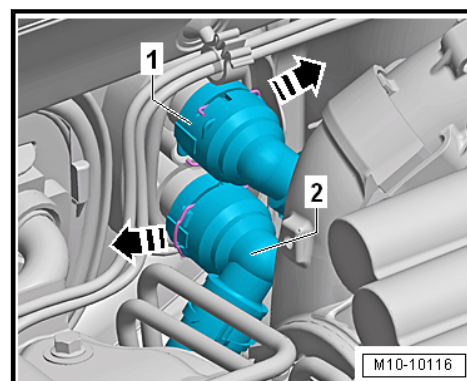
- Wear protective eyewear.
  - Wear safety gloves.
  - Reduce the pressure: Place clean cloths around the connection point and carefully open the connection point.
- 
- Disconnect the lines at the connection point. Wipe up any leaking fuel with a cloth.



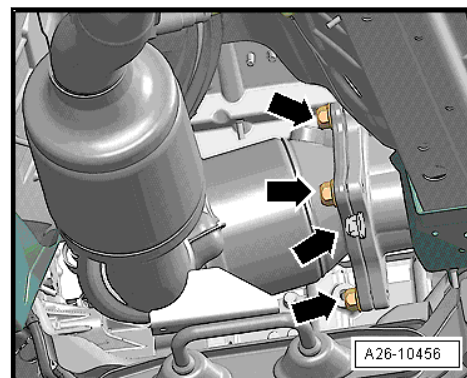
- 1 - Bleeder line (press the circlip to release the line).
- 2 - Vacuum line (press the circlip to release the line), if equipped.
- 3 - Fuel supply line (pull the circlip upward to release the line).
- Remove the upper coolant hose from the radiator -arrow- by removing securing clip slightly.



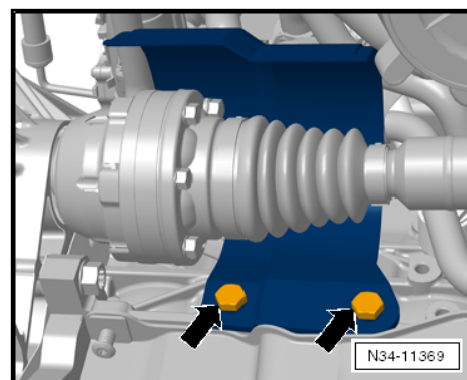
- Lift up the clips in the direction of -arrows-. Remove the coolant hose -1 and 2- from the heater core for the heater.



- From the top, remove the nuts -arrows- on the connection of the front exhaust pipe to the turbocharger.



- Remove the right drive axle heat shield -arrows-.



- Remove the drive axles. Refer to ⇒ Suspension, Wheels, Steering; Rep. Gr. 40; Drive Axles, Removing and Installing.

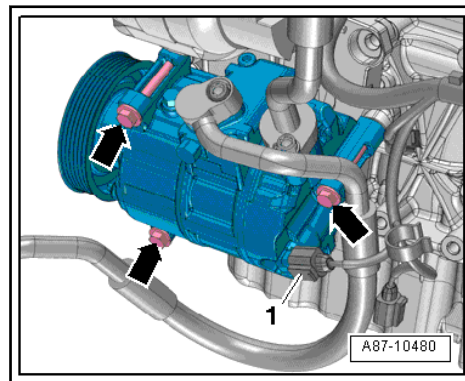




- Remove the front exhaust pipe with catalytic converter. Refer to ➤ [E1.2 exhaust Pipe, Removing and Installing](#), page 357.

#### Vehicles with A/C System

- Remove the ribbed belt. Refer to ➤ [B1.2 elt, Removing and Installing](#), page 45.
- Disconnect the connector -1- on the A/C compressor regulator valve.



#### WARNING

Danger of frostbite from refrigerant.

- Do not open the A/C system refrigerant circuit.

- Remove the A/C compressor bolts -arrows-.



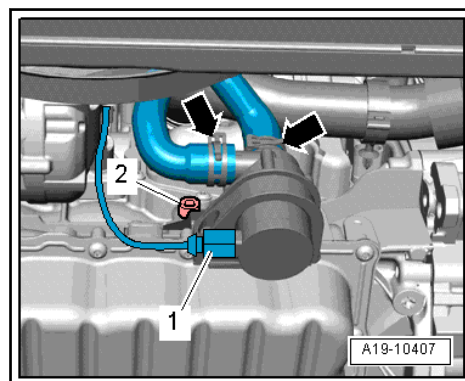
#### Note

*Do not bend, twist or stretch the refrigerant lines and hoses.*

- Tie up the A/C compressor to the longitudinal member with the refrigerant hoses still connected.

#### Continuation for All Vehicles

- Remove the Generator -C-. Refer to ➤ Rep. Gr. 27.
- Remove the bolt -2- on the bracket for the After-Run Coolant Pump -V51-.

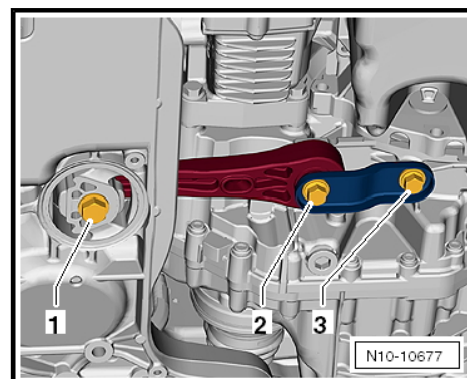




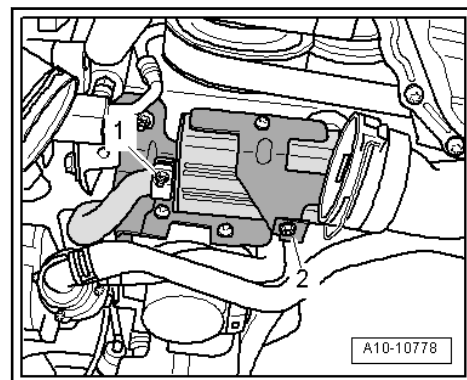
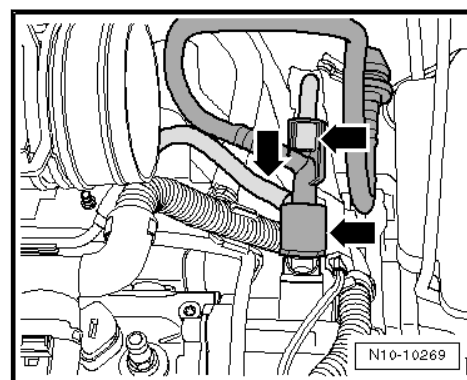
**Note**

*The After-Run Coolant Pump -V51- stays in the installation position.*

- Remove the bolt -1-.
- Then remove the bolts -2 and 3- and remove the pendulum support.

**Vehicles with Parking Heater**

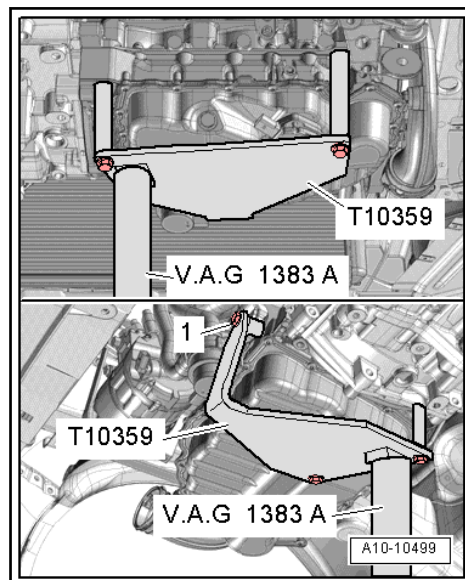
- Loosen the clamp -1- and remove the bolt -2-.
- Remove the parking heater muffler.
- Disconnect the necessary connections from the coolant pipes.

**Continuation for All Vehicles**

- Disconnect the vacuum hoses -arrows-.



- Remove/disconnect all necessary wires from the engine/transmission and free them up.
- Disconnect all connecting, coolant, vacuum and intake hoses from the engine.
- Tighten the Engine/Gearbox Jack - Engine Support - T10359A- to the cylinder block using the bolt -1- to approximately 20 Nm.



**Note**

*The threaded hole for the bolt -1- serves to secure the After-Run Coolant Pump -V51-.*

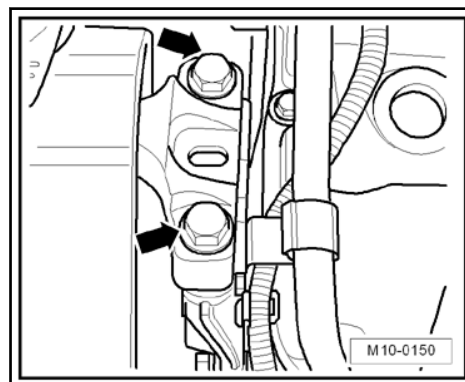
- Install the Engine and Gearbox Jack -VAS6931- on the Engine/Gearbox Jack - Engine Support -T10359A-.
- Slightly lift the engine/transmission assembly.



**Note**

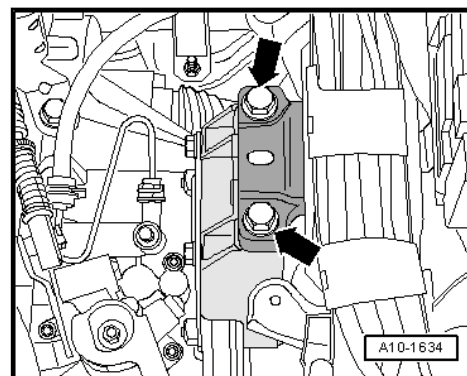
*Use the Step Ladder -VAS5085- to remove the subframe mount bolts.*

- Remove the subframe mount bolts -arrows- on the engine.



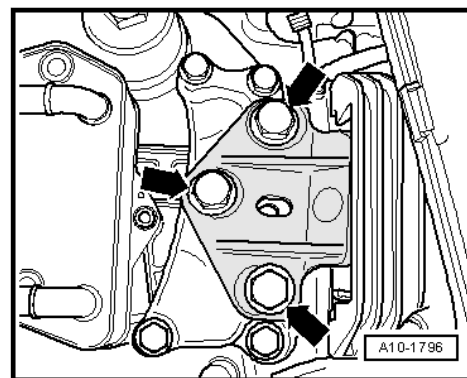


## Vehicles with Manual Transmission



- Remove the subframe mount bolts -arrows- on the transmission.

## Vehicles with DSG® Transmission



- Remove the subframe mount bolts -arrows- on the transmission.

### Continuation for All Vehicles:



#### Note

- ◆ *Make sure all the hose and line connections between the engine, transmission and body have been disconnected.*
- ◆ *While lowering, carefully guide the engine/transmission assembly to prevent any damage.*

### Vehicles with DSG® Transmission:

- Pay attention to the selector lever cable.

### Continuation for All Vehicles

- Pull the engine/transmission assembly as far forward and to the left as possible and slowly lower it.

The engine must be secured on the Engine and Gearbox Bracket -VAS6095A- when performing repair work. Refer to [S1.3 securing to Engine and Transmission Holder](#), page 18.

## 1.2 Engine and Transmission, Separating

### Special tools and workshop equipment required

- ◆ Engine/Gearbox Support Shackle (2 pc.) -10-222A/12-
- ◆ Shop Crane -VAS6100-



### Conditions

- Engine with the transmission is removed and secured to the Engine/Gearbox Jack - Engine Support -T10359A-.

### Separating

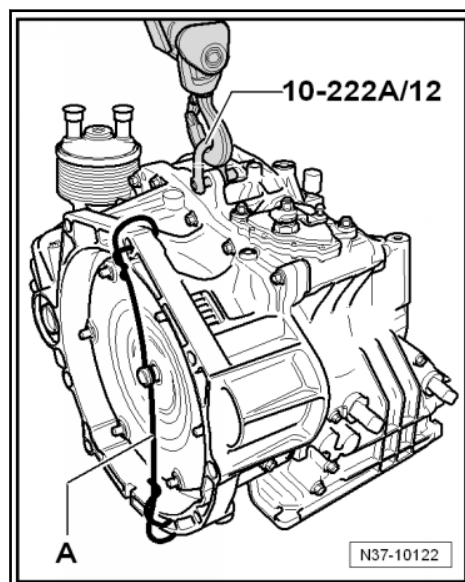
- Remove the starter. Refer to ⇒ Electrical Equipment; Rep. Gr. 27; Starter; Overview - Starter.

### Engine with DSG® Transmission

- Remove the coolant hoses from the transmission fluid cooler and seal off the openings.

### Continuation for All Transmissions

- Disconnect all the electrical connections from the transmission to the engine and free them up.
- Secure the transmission with Engine/Gearbox Support Shackle (2 pc.) -10-222A/12- on the Shop Crane -VAS6100- but do not lift.



- Remove the upper engine/transmission connecting bolts.
- Before the last bolts can be removed, the transmission must be supported with the Shop Crane -VAS6100-.
- Remove the lower engine/transmission connecting bolts.
- Separate the transmission from the engine; when doing this, guide the transmission.

### Assembling

Assemble in reverse order of removal while noting the tightening specification:

- ♦ Vehicles with manual transmission. Refer to ⇒ Rep. Gr. 34; Transmission, Removing and Installing; Transmission Tightening Specifications.
- ♦ Vehicles with DSG® transmission. Refer to ⇒ Rep. Gr. 34; Transmission, Removing and Installing; Transmission Tightening Specifications.

## 1.3 Engine, Securing to Engine and Transmission Holder

### Special tools and workshop equipment required



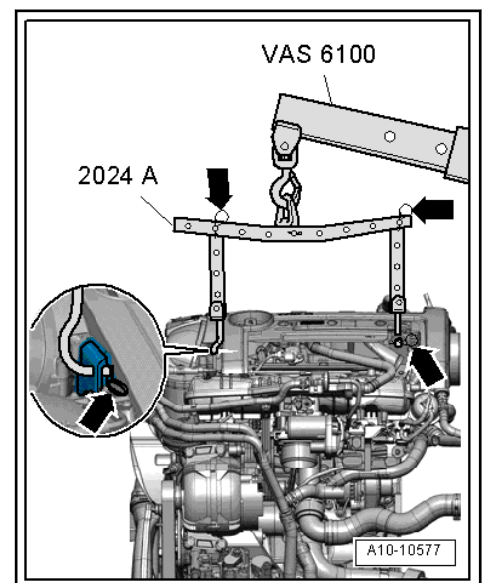
- ◆ Engine Sling -2024A-
- ◆ Shop Crane -VAS6100-
- ◆ Engine and Gearbox Bracket -VAS6095A-

#### Conditions

- The engine and transmission are removed and secured with the Engine/Gearbox Jack - Engine Support -T10359A- on the Engine and Gearbox Jack -VAS6931-.

#### Procedure

- Separate the transmission from the engine. Refer to [a1.2 nd Transmission, Separating](#), page 17 .
- Engage the Engine Sling -2024A- as shown. Lower the engine out of the Engine and Gearbox Jack -VAS6931- using the Shop Crane -VAS6100-.



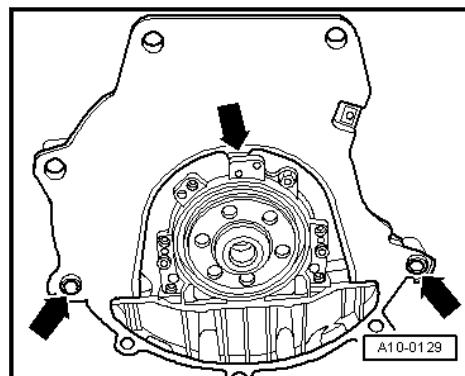
Use securing pins -arrows- on the hooks and pins to avoid damaging the engine.

- Secure the engine to the Engine and Gearbox Bracket -VAS6095A-.

## 1.4 Engine, Installing

Install in reverse order of removal. Note the following:

- Insert new alignment sleeves for centering the engine/transmission in the cylinder block.
- Engage the intermediate plate with the sealing flange and then slide it onto the alignment sleeves -arrows-.



#### Vehicles with Manual Transmission

- Assembly work on the clutch. Refer to ⇒ Rep. Gr. 30; Clutch Mechanism, Servicing; Overview - Clutch.

#### Vehicles with DSG® Transmission

- Assembly work on the clutch. Refer to ⇒ 6-Speed Dual Clutch Transmission 02E; Rep. Gr. 30; Overview - Dual Clutch.
- Replace the needle bearings in the crankshaft. Refer to ⇒ [N3.4 Needle Bearing, Replacing](#), page 72 .
- Pay attention to the selector lever cable.

#### Continuation for All Vehicles

- When installing engine/transmission assembly, check for clearance to the subframe as well as to the radiator.
- Adjust the subframe mount. Refer to ⇒ [M2.4 Mount, Adjusting](#), page 33 .

#### Vehicles with Manual Transmission

- Install the gearshift mechanism on the transmission. Refer to ⇒ Rep. Gr. 34; Shift Mechanism, Servicing; Selector Mechanism, Removing and Installing.

#### Vehicles with DSG® Transmission

- Install the selector lever cable on the transmission. Refer to ⇒ Rep. Gr. 34; Selector Mechanism; Selector Mechanism, Removing and Installing.

#### Continuation for All Vehicles

Electrical connections and routing. Refer to ⇒ Electrical Equipment; Rep. Gr. 97.

- Pay attention to the information after connecting the Battery. Refer to ⇒ Electrical Equipment; Rep. Gr. 27; Battery; Battery, Disconnecting and Connecting.
- Fill with coolant. Refer to ⇒ [D1.3 Draining and Filling](#), page 226 .
- Check the DTC memories of all control modules and erase any DTC entries, if necessary, which may have occurred during assembly. Use the Vehicle Diagnostic Tester in "Vehicle OBD".
- Perform a road test.

**Note**

*Follow all safety precautions during the road test. Refer to ➤ [P1.2 recautions during Road Test with Testing Equipment](#), page 1.*

- Perform a vehicle system test and correct any faults if necessary.

**Note**

*If the DTC memory was erased, the readiness code must be regenerated using the Vehicle Diagnostic Tester in "Guided Functions".*

**Tightening Specification**

- ◆ Refer to ➤ [-2.1 Subframe Mount](#), page 22

| Threaded Connection |      | Tightening Specification |
|---------------------|------|--------------------------|
| Bolts and Nuts      | M 6  | 9 Nm                     |
|                     | M 7  | 15 Nm                    |
|                     | M 8  | 23 Nm                    |
|                     | M 10 | 40 Nm                    |
|                     | M 12 | 60 Nm                    |



## 2 Subframe Mount

⇒ [2.1 Subframe Mount", page 22](#)

⇒ [M2.2 ount, Removing and Installing", page 24](#)

⇒ [S2.3 upporting in Installation Position", page 29](#)

⇒ [M2.4 ount, Adjusting", page 33](#)

⇒ [M2.5 ount, Checking Adjustment", page 36](#)

### 2.1 Overview - Subframe Mount



**1 - Bolt**

- ☐ Transmission support to transmission

**Tightening specification:**

- ☐ Vehicles with a manual transmission. Refer to ⇒ Rep. Gr. 34; Transmission, Removing and Installing; Transmission Tightening Specifications.
- ☐ Vehicles with a DSG® transmission. Refer to ⇒ Rep. Gr. 34; Transmission, Removing and Installing; Transmission Tightening Specifications.

**2 - Bolts**

- ☐ 50 Nm +90° turn
- ☐ Replace after removing
- ☐ Pendulum support to transmission

**3 - Engine Support****4 - Bolt**

- ☐ 40 Nm +180° turn
- ☐ Replace after removing
- ☐ Engine support to engine

**5 - Engine Mount**

- ☐ Removing and installing. Refer to ⇒ [M2.2 Mount, Removing and Installing", page 24](#).

**6 - Bolt**

- ☐ 40 Nm +90° turn
- ☐ Replace after removing
- ☐ Engine mount to body

**7 - Bracket****8 - Bolt**

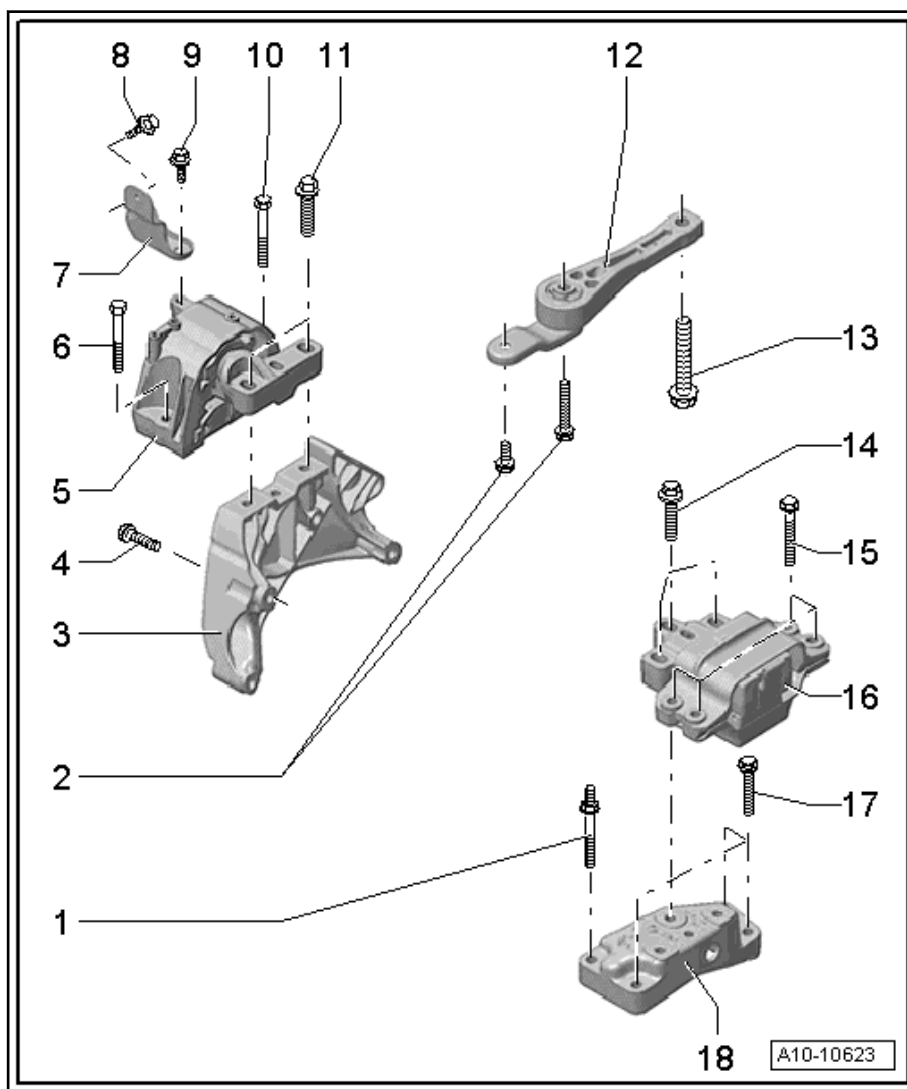
- ☐ 20 Nm +90° turn
- ☐ Replace after removing
- ☐ Bracket to engine mount

**9 - Bolt**

- ☐ 20 Nm +90° turn
- ☐ Replace after removing
- ☐ Bracket to body

**10 - Bolt**

- ☐ 40 Nm +90° turn
- ☐ Replace after removing
- ☐ Engine mount to body





### 11 - Bolts

- ☐ 60 Nm +90° turn
- ☐ Replace after removing
- ☐ Engine mount to engine support

### 12 - Pendulum Support

- ☐ First install the pendulum support to the transmission and then to the subframe

### 13 - Bolt

- ☐ 100 Nm +90° turn
- ☐ Replace after removing
- ☐ Pendulum support to subframe

### 14 - Bolt

- ☐ 60 Nm +90° turn
- ☐ Replace after removing
- ☐ Transmission mount to transmission support

### 15 - Bolt

- ☐ 40 Nm +90° turn
- ☐ Replace after removing
- ☐ Transmission mount to body

### 16 - Transmission Mount

- ☐ The illustration shows the DSG® transmission version

### 17 - Bolt

- ☐ Transmission support to transmission

Tightening specification:

- ☐ Vehicles with a manual transmission. Refer to ⇒ Rep. Gr. 34; Transmission, Removing and Installing; Transmission Tightening Specifications.
- ☐ Vehicles with a DSG transmission. Refer to ⇒ Rep. Gr. 34; Transmission, Removing and Installing; Transmission Tightening Specifications.

### 18 - Transmission Support

## 2.2 Engine Mount, Removing and Installing

### Special tools and workshop equipment required

- ◆ Engine Support Bridge -10-222A-
- ◆ Engine Support Bridge - Spindle -10-222A/11-
- ◆ Engine Support Bridge - Engine Support 28 -10-222A/28-
- ◆ Engine Support Bridge - Engine Support 31 -10-222A/31-
- ◆ Engine Support - Basic Set - Rail with Holes -T40091/2- from the Engine Support - Basic Set -T40091-
- ◆ Engine Support - Supplement Kit - Mount -T40093/5- from the Engine Support - Supplement Kit -T40093A-
- ◆ Engine Support Bridge - Engine Support 28-2 -10-222A/28-2-, quantity: 2
- ◆ Engine Support - Basic Set - Square Pipe -T40091/1- (quantity: 2) from the Engine Support - Basic Set -T40091-
- ◆ Engine Support - Basic Set - Movable Joint -T40091/3- (quantity: 2) from the Engine Support - Basic Set -T40091-
- ◆ Engine Support - Movable Joint -T40093/4- (quantity: 2) from the Engine Support - Supplement Kit -T40093A-



- ◆ Torque Wrench 1331 5-50Nm -VAG1331-

## Procedure



### Note

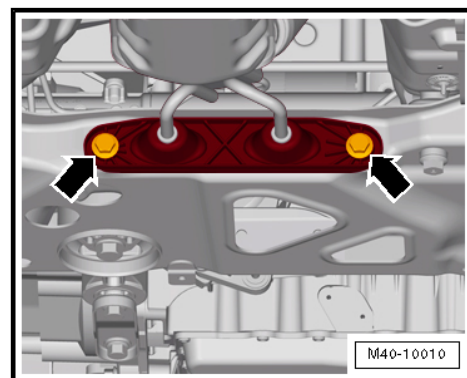
*Without removing the battery and battery tray*

## Removing

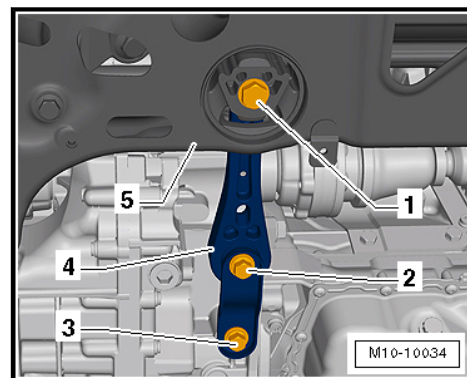


### Note

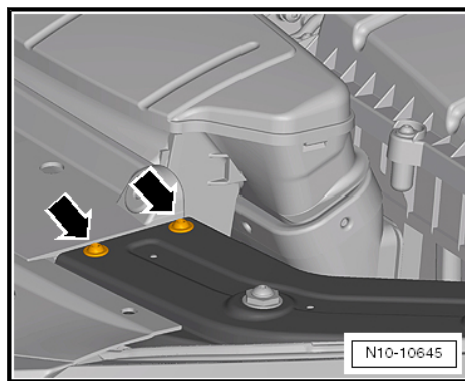
- ◆ Risk of damaging the decoupling element
  - ◆ Do not bend the decoupling element more than 10°.
  - ◆ Do not stretch the decoupling element.
  - ◆ Do not damage the wire mesh on the decoupling element.
- Remove the exhaust system bracket from the subframe -arrows-.



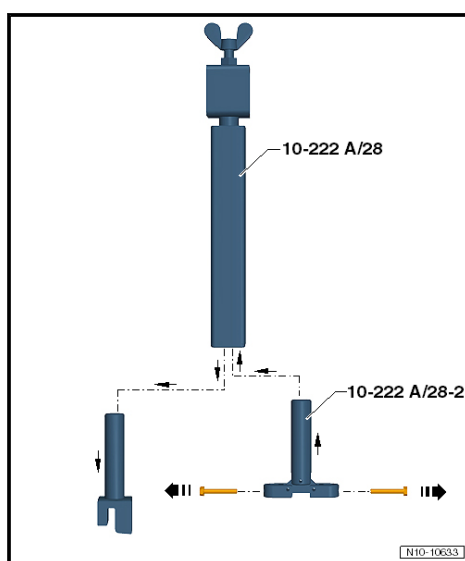
- Remove the bolt -1-.



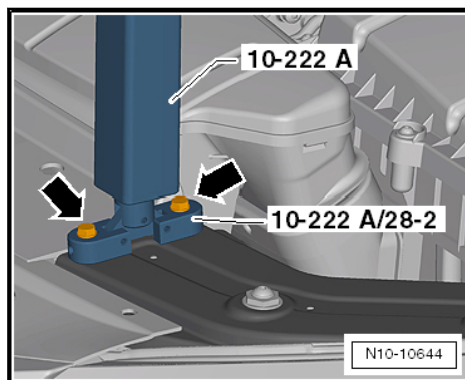
- Remove the bolts -2 and 3-.
- Remove the pendulum support.
- Remove the engine cover. Refer to [⇒ C3.1 over, Removing and Installing", page 37](#) .
- Remove the plenum chamber cover. Refer to [⇒ Body Exterior; Rep. Gr. 50; Plenum Chamber Cover; Plenum Chamber Cover, Removing and Installing](#).
- Remove the bolts -arrows- for the lock carrier retaining bracket on the left and right sides



- Remove the lower mounts on the Engine Support Bridge - Engine Support 28 -10-222A/28- and replace with the Engine Support Bridge - Engine Support 28-2 -10-222A/28-2-.



- Remove the bolts -arrows- for securing the engine support bridge on the lock carrier from the Engine Support Bridge - Engine Support 28-2 -10-222A/28-2-.
- Use the bolts from the Engine Support Bridge - Engine Support 28-2 -10-222A/28-2- for attaching the Engine Support Bridge - Engine Support 28 -10-222A/28-.
- Do not use the bolts for the retaining bracket.

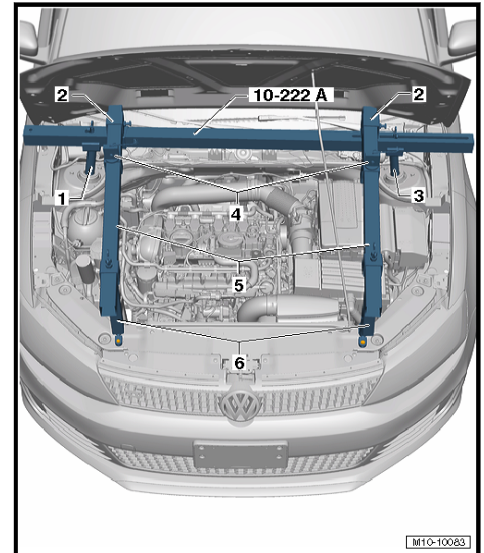


- Bolt tightening specification -arrows-: 8 Nm

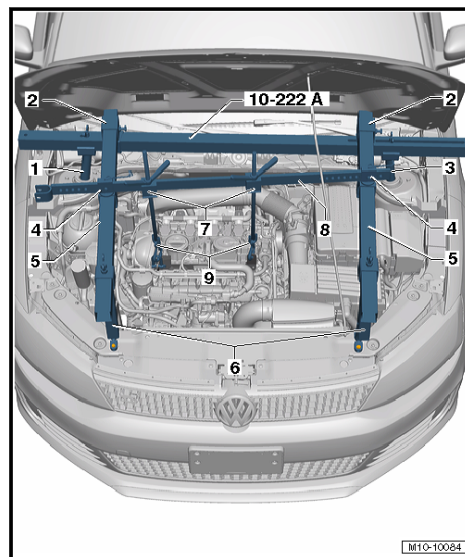
**Note**

*A second technician is needed when positioning the Engine Support Bridge -10-222A- on the vehicle to keep the Engine Support Bridge -10-222A- from tipping.*

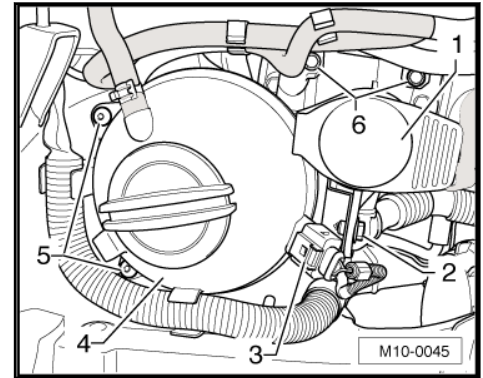
Mount the engine support bridge as follows to support the engine/transmission assembly:



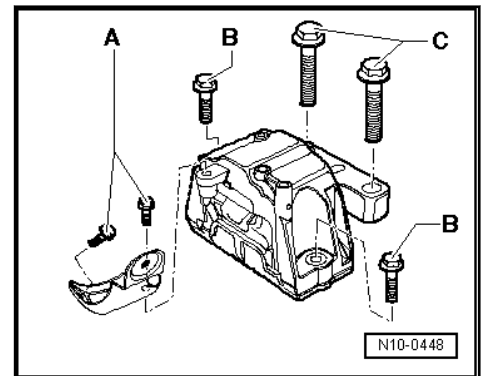
- 1 - Engine Support Bridge - Engine Support 31 Adapter 31-2 -10-222A/31-2-
  - 2 - Engine Support - Basic Set - Moveable Joint -T40091/3-
  - 3 - Engine Support Bridge - Engine Support 31 Adapter 31-1 -10-222A/31-1-
  - 4 - Engine Support - Supplement Kit - Movable Joint - T40093/4-
  - 5 - Engine Support - Basic Set - Square Pipe -T40091/1-
  - 6 - Engine Support Bridge - Engine Support 28 -10-222A/28- with Engine Support Bridge - Engine Support 28-2 -10-222A/28-2-
- First slide the Movable Joints -2- onto the Square Pipe of the Engine Support Bridge -10-222A-.
  - The bolts for the Engine Support - Basic Set - Moveable Joint -T40091/3- -2- on the Engine Support Bridge -10-222A- point in the direction of travel.
  - Mount the Engine Support Bridge -10-222A- on the suspension strut domes and have a second technician hold it to prevent it from falling over.
  - Slide the Engine Support - Basic Set - Square Pipe - T40091/1- -5- on the left and right sides through the Engine Support Bridge - Engine Support 28 -10-222A/28- -6- from the front and position the Moveable Joints -T40093/4- -4- on each side.
  - Slide the Engine Support - Basic Set - Rail with Holes -T40091/2- -8- with the Engine Support - Supplement Kit - Mounts -T40093/5- -7- into the Engine Support - Supplement Kit - Moveable Joints -T40093/4- -4-.



- 1 - Engine Support Bridge - Engine Support 31 Adapter 31-2 -10-222A/31-2-
  - 2 - Engine Support - Basic Set - Moveable Joint -T40091/3-
  - 3 - Engine Support Bridge - Engine Support 31 Adapter 31-1 -10-222A/31-1-
  - 4 - Engine Support - Supplement Kit - Movable Joint - T40093/4-
  - 5 - Engine Support - Basic Set - Square Pipe -T40091/1-
  - 6 - Engine Support Bridge - Engine Support 28 -10-222A/28- with Engine Support Bridge - Engine Support 28-2 -10-222A/28-2-
  - 7 - Engine Support - Supplement Kit - Mount -T40093/5-
  - 8 - Engine Support - Basic Set - Rail with Holes -T40091/2-
  - 9 - Engine Support Bridge - Spindle -10-222A/11-
- Insert the securing pin into the Engine Support - Basic Set - Rail with Holes -T40091/2- -8- and secure it with cotter pins.
  - Tighten all bolted connections on the Engine Support Bridge hand-tight. While doing so, adjust the height of the Engine Support Bridge parallel over the Engine Support Bridge - Engine Support 28 -10-222A/28-.
  - Gently pretension the engine/transmission assembly via the Engine Support Bridge - Spindles -10-222A/11- -9-, but do not lift.
  - Remove the bolt -2- and move the washer fluid reservoir filler neck forward -1-.



- Remove the bolts -5- and place the coolant expansion tank on the engine, with the hoses still connected.



- Remove the engine mount bolts -A, B and C-. Remove the engine mount upward.

### Installing

Install in reverse order of removal. Note the following:

### Tightening Specification

- ◆ Refer to [⇒ -1.1 Muffler”, page 354](#)
- ◆ Refer to [⇒ -2.1 Subframe Mount”, page 22](#)

## 2.3 Engine, Supporting in Installation Position

### Special tools and workshop equipment required

- ◆ Engine Support Bridge -10-222A-
- ◆ Engine Support Bridge - Spindle -10-222A/11-
- ◆ Engine Support Bridge - Engine Support 28 -10-222A/28-
- ◆ Engine Support Bridge - Engine Support 31 -10-222A/31-
- ◆ Engine Support - Basic Set - Rail with Holes -T40091/2- from the Engine Support - Basic Set -T40091-
- ◆ Engine Support - Supplement Kit - Mount -T40093/5- from the Engine Support - Supplement Kit -T40093A-
- ◆ Engine Support Bridge - Engine Support 28-2 -10-222A/28-2-, quantity: 2
- ◆ Engine Support - Basic Set - Square Pipe -T40091/1- (quantity: 2) from the Engine Support - Basic Set -T40091-
- ◆ Engine Support - Basic Set - Movable Joint -T40091/3- (quantity: 2) from the Engine Support - Basic Set -T40091-





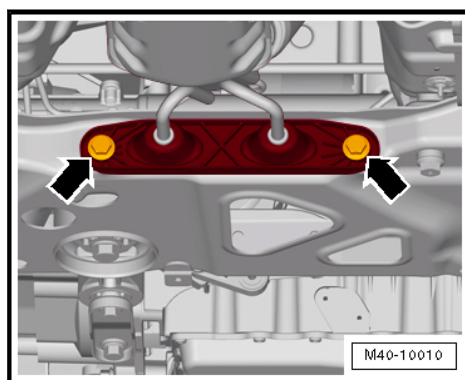
- ◆ Engine Support - Movable Joint -T40093/4- (quantity: 2)  
from the Engine Support - Supplement Kit -T40093A-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-

### Procedure

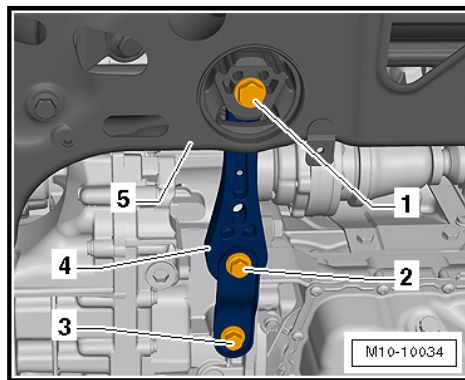


### Note

- ◆ *Do not bend the decoupling element more than 10°.*
- ◆ *Do not stretch the decoupling element.*
- ◆ *Do not damage the wire mesh on the decoupling element.*
- Remove the exhaust system bracket from the subframe  
-arrows-.

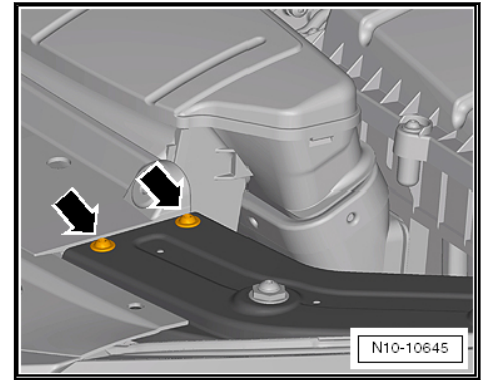


- Remove the bolt -1-.

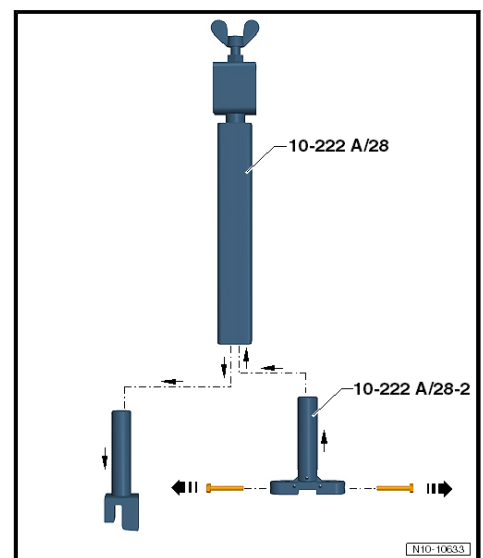


- Remove the bolts -2 and 3-.
- Remove the pendulum support.
- Remove the plenum chamber cover. Refer to ⇒ Body Exterior; Rep. Gr. 50; Plenum Chamber Cover; Plenum Chamber Cover, Removing and Installing.
- Remove the engine cover. Refer to ⇒ [C3.1 over, Removing and Installing](#), page 37 .
- Remove the air filter housing. Refer to ⇒ [F3.2 ilter Housing, Removing and Installing](#), page 312 .
- Remove the battery and the battery tray. Refer to ⇒ Electrical Equipment; Rep. Gr. 27; Battery; Battery, Removing and Installing.
- Remove the bolts -arrows- for the lock carrier retaining bracket on the left and right sides

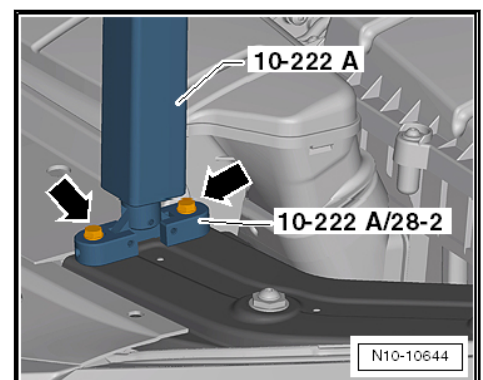




- Remove the lower mounts on the Engine Support Bridge - Engine Support 28 -10-222A/28- and replace with the Engine Support Bridge - Engine Support 28-2 -10-222A/28-2-.



- Remove the bolts in direction of -arrows- for securing the engine support bridge on the lock carrier from the Engine Support Bridge - Engine Support 28-2 -10-222A/28-2-.
- Use the bolts from the Engine Support Bridge - Engine Support 28-2 -10-222A/28-2- for attaching the Engine Support Bridge - Engine Support 28 -10-222A/28-. Do not use the bolts for the retaining bracket.



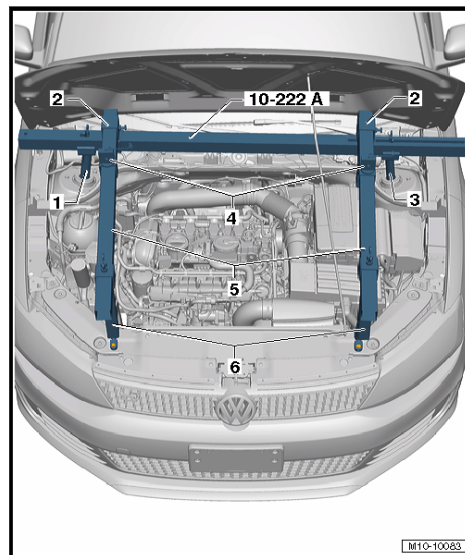
- Bolt tightening specification -arrows-: 8 Nm



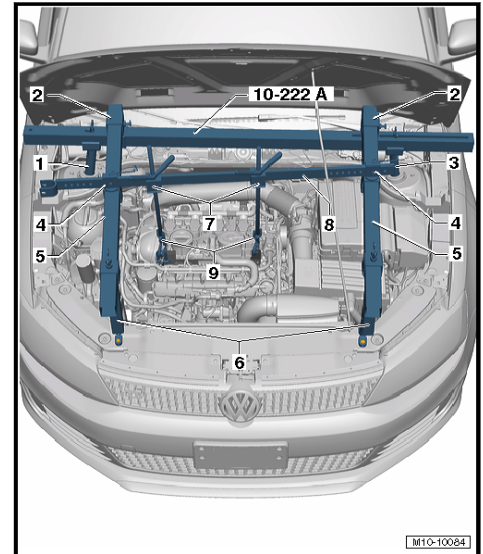
## Note

*A second technician is needed when positioning the Engine Support Bridge -10-222A- on the vehicle to keep the Engine Support Bridge -10-222A- from tipping.*

Mount the engine support bridge as follows to support the engine/transmission assembly:



- 1 - Engine Support Bridge - Engine Support 31 Adapter 31-2 -10-222A/31-2-
  - 2 - Engine Support - Basic Set - Moveable Joint -T40091/3-
  - 3 - Engine Support Bridge - Engine Support 31 Adapter 31-1 -10-222A/31-1-
  - 4 - Engine Support - Supplement Kit - Movable Joint - T40093/4-
  - 5 - Engine Support - Basic Set - Square Pipe -T40091/1-
  - 6 - Engine Support Bridge - Engine Support 28 -10-222A/28- with Engine Support Bridge - Engine Support 28-2 -10-222A/28-2-
- First slide the Movable Joints -2- onto the Square Pipe of the Engine Support Bridge -10-222A-.
  - The bolts for the Movable Joints -T40091/3- -2- on the Engine Support Bridge -10-222A- point in the direction of travel.
  - Mount the Engine Support Bridge -10-222A- on the suspension strut domes and have a second technician hold it to prevent it from falling over.
  - Slide the Engine Support - Basic Set - Square Pipe - T40091/1- -5- on the left and right sides through the Engine Support Bridge - Engine Support 28 -10-222A/28- -6- from the front and position the Moveable Joints -T40093/4- -4- on each side.
  - Slide the Engine Support - Basic Set - Rail with Holes -T40091/2- -8- with the Engine Support - Supplement Kit - Mounts -T40093/5- -7- into the Engine Support - Supplement Kit - Moveable Joints -T40093/4- -4-.



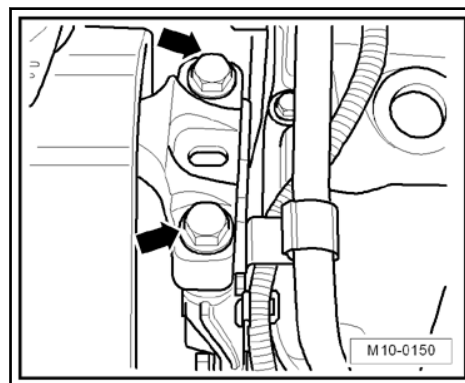
- 1 - Engine Support Bridge - Engine Support 31 Adapter 31-2 -10-222A/31-2-
  - 2 - Engine Support - Basic Set - Moveable Joint -T40091/3-
  - 3 - Engine Support Bridge - Engine Support 31 Adapter 31-1 -10-222A/31-1-
  - 4 - Engine Support - Supplement Kit - Movable Joint - T40093/4-
  - 5 - Engine Support - Basic Set - Square Pipe -T40091/1-
  - 6 - Engine Support Bridge - Engine Support 28 -10-222A/28- with Engine Support Bridge - Engine Support 28-2 -10-222A/28-2-
  - 7 - Engine Support - Supplement Kit - Mount -T40093/5-
  - 8 - Engine Support - Basic Set - Rail with Holes -T40091/2-
  - 9 - Engine Support Bridge - Spindle -10-222A/11-
- Insert the securing pin into the Engine Support - Basic Set - Rail with Holes -T40091/2- -8- and secure it with cotter pins.
  - Tighten all bolted connections on the Engine Support Bridge -10-222A- hand-tight. While doing so, adjust the height of the Engine Support Bridge -10-222A- parallel over the Engine Support Bridge - Engine Support 28 -10-222A/28-.
  - Gently pretension the engine/transmission assembly via the Engine Support Bridge - Spindles -10-222A/11- -9-, but do not lift.

#### Tightening Specification

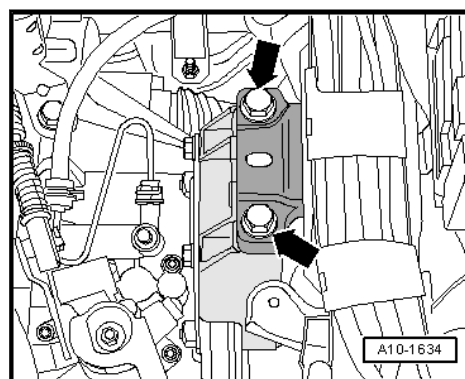
- ◆ Refer to [⇒ -1.1 Muffler", page 354](#)
- ◆ Refer to [⇒ -2.1 Subframe Mount", page 22](#)

## 2.4 Subframe Mount, Adjusting

- Support the engine with the transmission but do not lift it. Refer to [⇒ S2.3 supporting in Installation Position", page 29](#) .
- Replace the subframe mount bolts -arrows- one after the other (if the was not already performed with the engine was installed) and hand tighten.

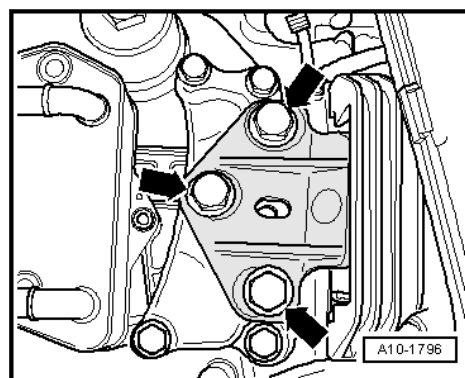


#### Vehicles with Manual Transmission



- Replace the subframe mount bolts -arrows- one after the other (if the was not already performed with the engine was installed) and hand tighten.

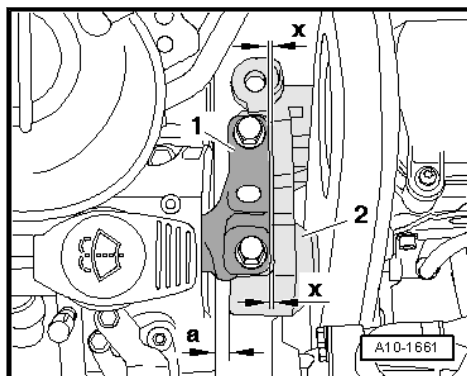
#### Vehicles with DSG® Transmission



- Replace the subframe mount bolts -arrows- one after the other (if the was not already performed with the engine was installed) and hand tighten.

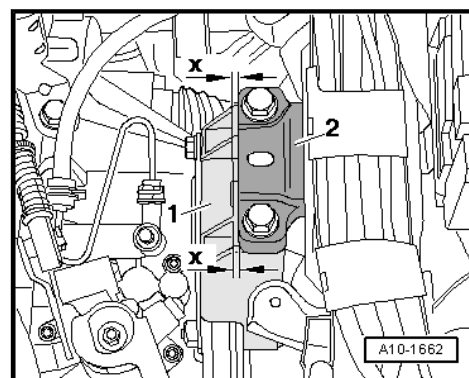
#### Continuation for All Vehicles

- Loosen the left and right support arm bolts approximately two turns.
- There must be a distance -a- of 10 mm between the engine support and right longitudinal member.



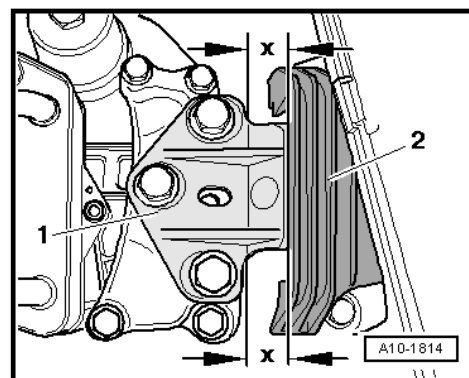
- Casting edge on engine support -2- must stand parallel to the support arm -1-. Dimension -x- must be the same in the front and in the rear.

#### Vehicles with Manual Transmission



- Make sure that the edges on the support arm -1- and transmission mount -2- are parallel on the transmission side.
- Dimension -x- is the same size on both sides of the mount.

#### Vehicles with DSG® Transmission



- Make sure that the edges on the support arm -1- and transmission mount -2- are parallel on the transmission side.
- Dimension -x- is the same size on both sides of the mount.

#### Continuation for All Vehicles

- Tighten the subframe mount bolts.

The rest of the installation is the reverse order of removal.

#### Tightening Specification

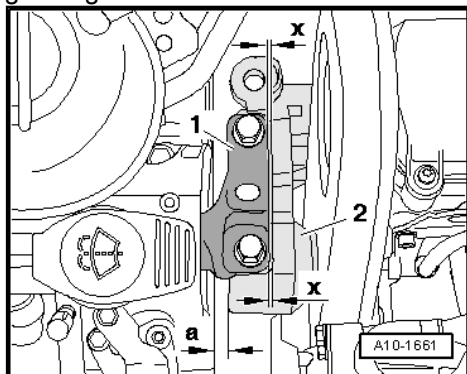
- ◆ Refer to [-1.1 Muffler-, page 354](#)



- ◆ Refer to ➤ [-2.1 Subframe Mount", page 22](#)

## 2.5 Subframe Mount, Checking Adjustment

- There must be a distance -a- of 10 to 13 mm between the engine support and right longitudinal member.



- Casting edge on engine support -2- must stand parallel to the support arm -1-. Dimension -x- must be the same in the front and in the rear.



### Note

*Distance -a- can be checked with a corresponding round stock.*

**Only If There Is Noise (the Engine or Transmission Hitting the Longitudinal Member When Driving around Curves) and Dimension -a- Is Not within 10 to 13 mm:**

- Adjust the subframe mount. Refer to ➤ [M2.4 ount, Adjusting", page 33](#) .

### Tightening Specification

- ◆ Refer to ➤ [-1.1 Muffler", page 354](#)
- ◆ Refer to ➤ [-2.1 Subframe Mount", page 22](#)



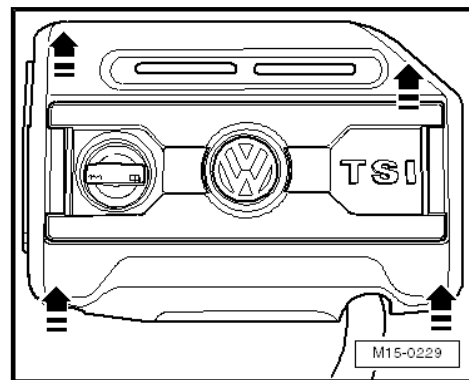
### 3 Engine Cover

⇒ C3.1 over, **Removing and Installing**", page 37

#### 3.1 Engine Cover, Removing and Installing

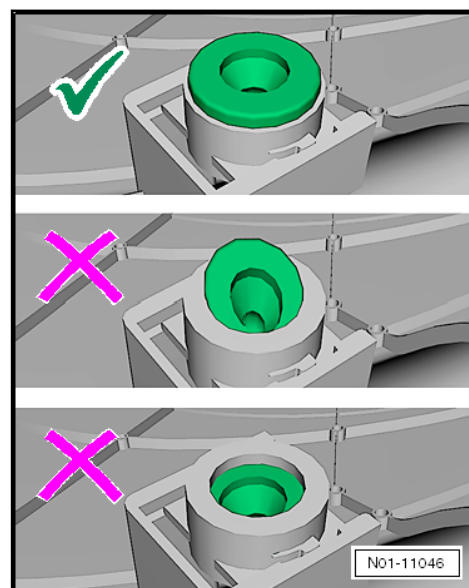
##### Removing

- Remove the engine cover in direction of -arrows-.



##### Installing

- Make sure the rubber bushings are inserted correctly into the mounts when installing.



- Carefully press the engine cover back into the catch.



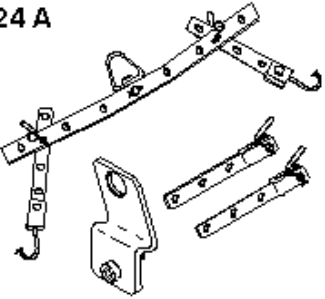
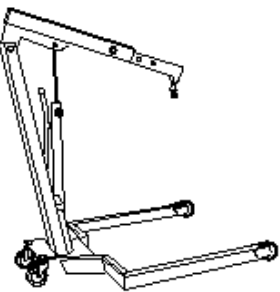
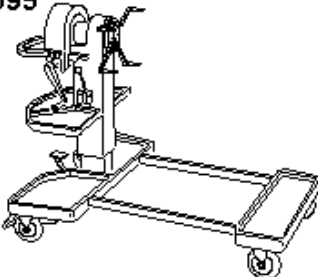
##### Note

*To prevent damage to the engine cover, do not hit it with a fist or a tool.*



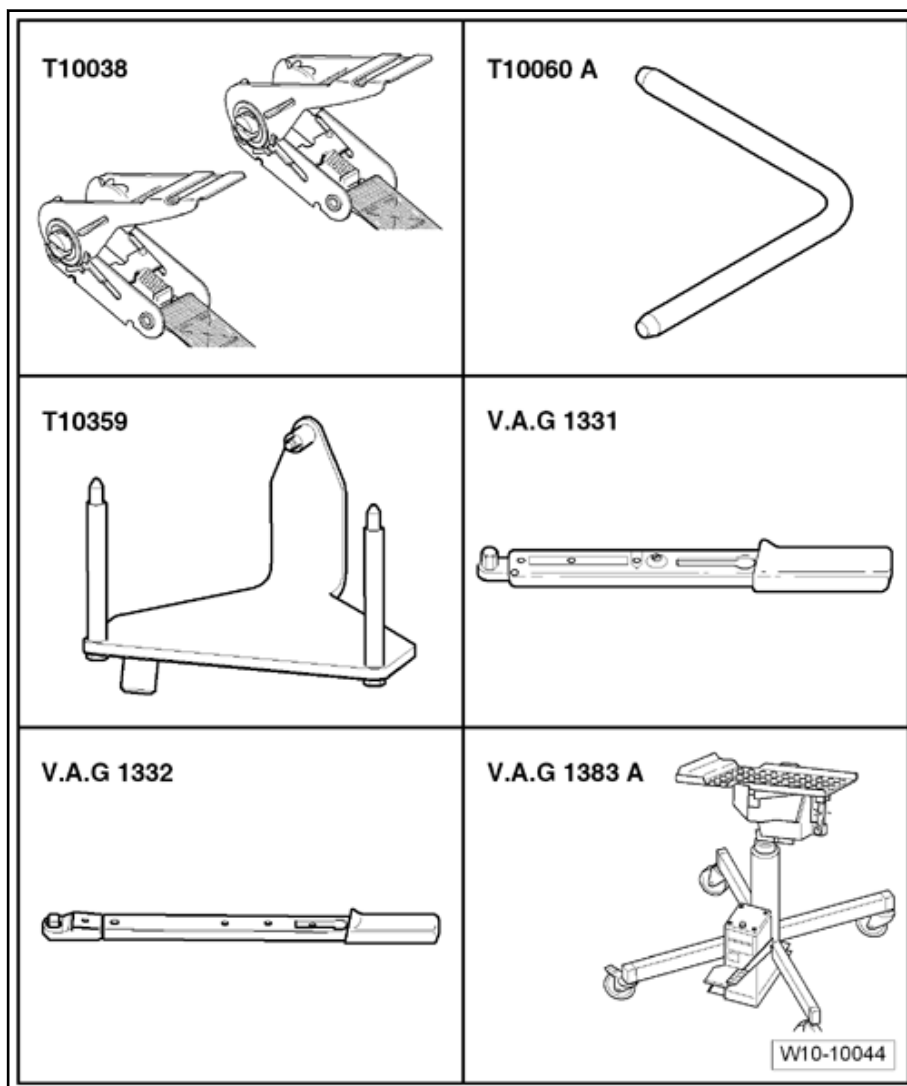
## 4 Special Tools

Special tools and workshop equipment required

|   |  |
|---|--|
| <p><b>2024 A</b></p>     | <p><b>VAS 6100</b></p>  |
| <p><b>VAS 6095</b></p>  |  |
|   | <p>W10-10006</p>   |



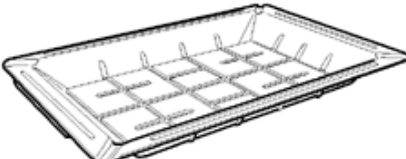
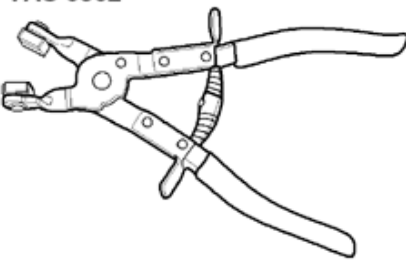

- ◆ Engine Sling -2024A-
- ◆ Shop Crane -VAS6100-
- ◆ Engine and Gearbox Bracket -VAS6095A-



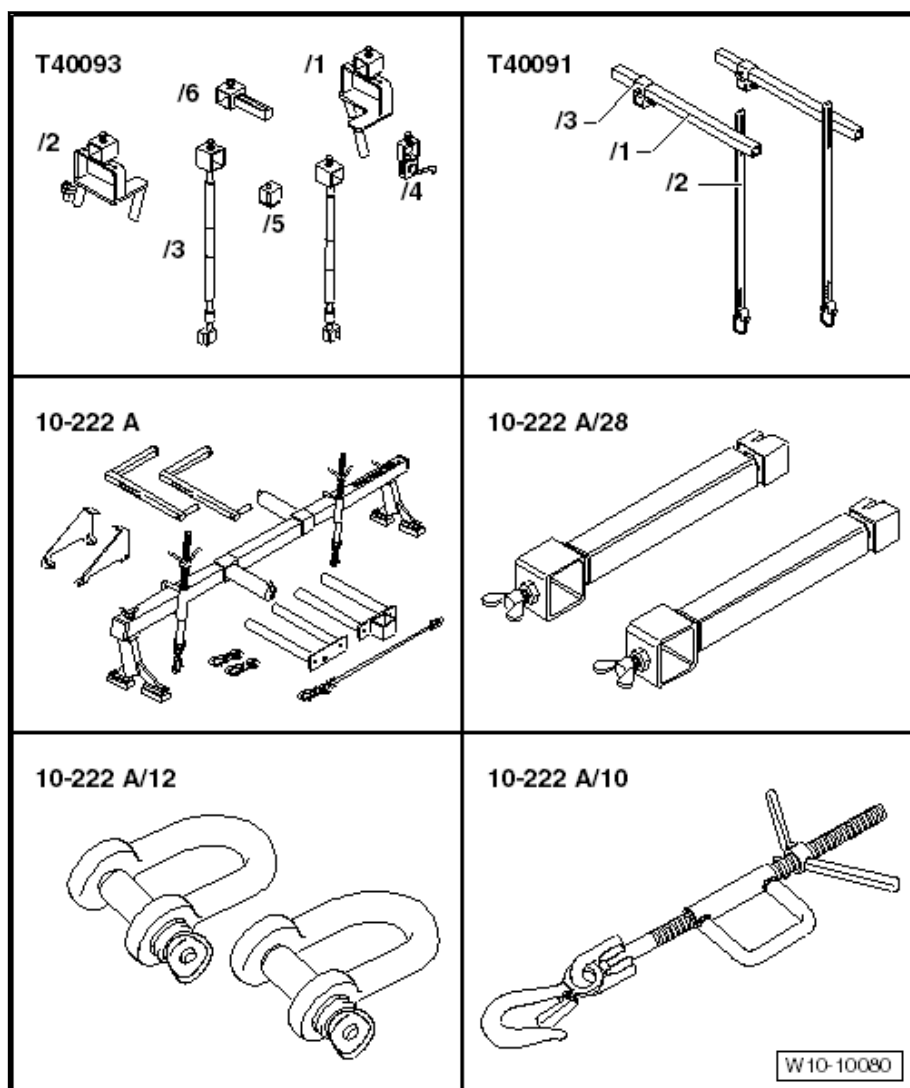


- ◆ Tensioning Strap -T10038-
- ◆ Locking Pin -T10060A-
- ◆ Engine/Gearbox Jack - Engine Support -T10359A-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Torque Wrench 1332 40-200Nm -VAG1332-
- ◆ Engine and Gearbox Jack -VAS6931-



|  |   |
|--|---|
| <b>VAS 5085</b><br> | <b>VAS 6122</b><br> |
| <b>VAS 6208</b><br> | <b>VAS 6362</b><br> |
|  |                  |

- ◆ Step Ladder -VAS5085-
- ◆ Engine Bung Set -VAS6122-
- ◆ Drip Tray for VAG1202A -VAG1306- or Shop Crane - Drip Tray -VAS6208-
- ◆ Spring Clip Pliers



- ◆ Engine Support Bridge -10-222A-
- ◆ Engine Support Bridge - Spindle -10-222A/11-
- ◆ Engine Support Bridge - Engine Support 28 -10-222A/28-
- ◆ Engine Support Bridge - Engine Support 31 -10-222A/31-
- ◆ Engine Support - Basic Set - Rail with Holes -T40091/2- from the Engine Support - Basic Set -T40091-
- ◆ Engine Support - Supplement Kit - Mount -T40093/5- from the Engine Support - Supplement Kit -T40093A-
- ◆ Engine Support Bridge - Engine Support 28-2 -10-222A/28-2-, quantity: 2
- ◆ Engine Support - Basic Set - Square Pipe -T40091/1- (quantity: 2) from the Engine Support - Basic Set -T40091-
- ◆ Engine Support - Basic Set - Movable Joint -T40091/3- (quantity: 2) from the Engine Support - Basic Set -T40091-
- ◆ Engine Support - Movable Joint -T40093/4- (quantity: 2) from the Engine Support - Supplement Kit -T40093A-



## 13 – Crankshaft, Cylinder Block

### 1 Cylinder Block, Belt Pulley Side

⇒ [-1.1 Ribbed Belt Drive", page 42](#)

⇒ [B1.2 elt, Removing and Installing", page 45](#)

⇒ [B1.3 elt Tensioner, Removing and Installing", page 46](#)

⇒ [D1.4 amper, Removing and Installing", page 49](#)

⇒ [D1.5 amper Seal, Replacing", page 51](#)

⇒ [B1.6 racket, Removing and Installing", page 52](#)

#### 1.1 Overview - Ribbed Belt Drive

**1 - Vibration Damper**

- ☐ With the ribbed belt pulley
- ☐ Removing and installing. Refer to ⇒ [D1.4 amper, Removing and Installing", page 49](#).

**2 - O-Ring**

- ☐ No replacement parts, part of the bolt

**3 - Bolt**

- ☐ 150 Nm + 90° turn
- ☐ Replace after removing
- ☐ Use the Counterhold - Vibration Damper - T10355- to loosen and tighten

**4 - Ribbed Belt**

- ☐ Before removing, mark the running direction using chalk or felt-tip pen
- ☐ Check for wear
- ☐ Removing and installing. Refer to ⇒ [B1.2 elt, Removing and Installing", page 45](#).

**5 - Ribbed Belt Tensioner**

- ☐ To release tension on the ribbed belt, pivot with a wrench.
- ☐ Secure using the Locking Pin - T10060A-

- ☐ Tensioning device for ribbed belt. Refer to ⇒ [Fig. "Ribbed Belt Tensioner Individual Components", page 44](#)
- ☐ Removing and installing. Refer to ⇒ [B1.3 elt Tensioner, Removing and Installing", page 46](#).

**6 - Sub-Assembly Bracket**

- ☐ With Oil Pressure Switch -F1-, oil filter and engine oil cooler
- ☐ Sub-assembly bracket, removing and installing. Refer to ⇒ [B1.6 racket, Removing and Installing", page 52](#).
- ☐ Oil filter, engine oil cooler and oil pressure switch. Refer to ⇒ [F3 ilter/Oil Pressure Switch", page 206](#).

**7 - Bolt**

- ☐ 10 Nm

**8 - Generator -C-**

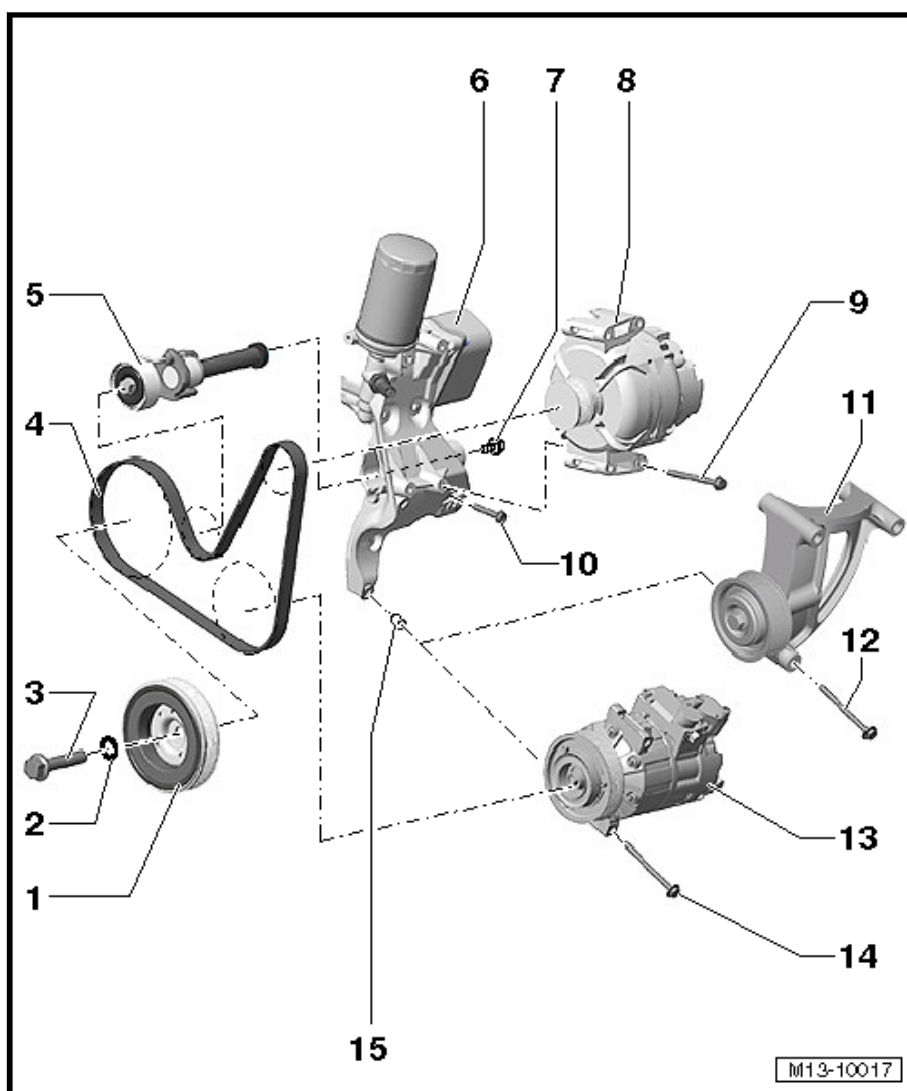
- ☐ Removing and installing. Refer to ⇒ Electrical Equipment; Rep. Gr. 27; Generator; Generator, Removing and Installing.

**9 - Bolt**

- ☐ 23 Nm

**10 - Bolt**

- ☐ Tightening sequence and specification. Refer to ⇒ [Fig. "Accessory Assembly Bracket - Tightening Sequence and Tightening Specification", page 44](#).
- ☐ Replace after removing





#### 11 - Bracket with Idler Roller

- ☐ For vehicles without air conditioning system

#### 12 - Bolt

- ☐ 25 Nm

#### 13 - A/C Compressor

- ☐ Do not remove or disconnect refrigerant lines
- ☐ Removing and installing. Refer to ⇒ Heating, Ventilation and Air Conditioning; Rep. Gr. 87.

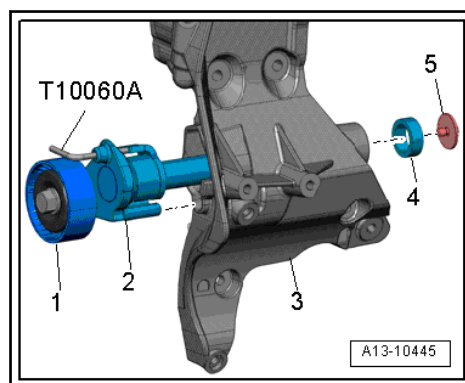
#### 14 - Bolt

- ☐ 25 Nm

#### 15 - Alignment Sleeve

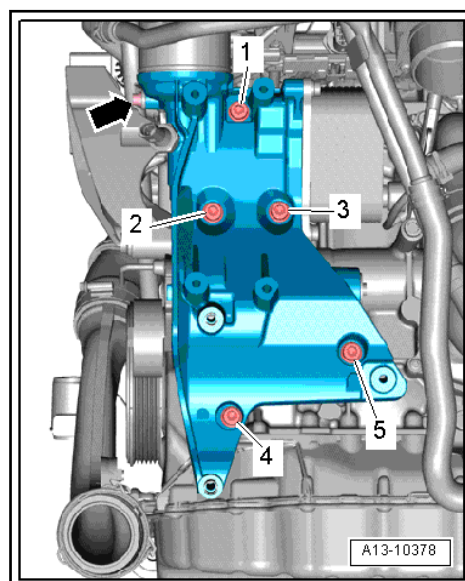
- ☐ For A/C compressor or bracket with idler roller

### Ribbed Belt Tensioner Individual Components



- 1 - Ribbed belt tensioner
- 2 - Support
- 3 - Sub-Assembly bracket
- 4 - Centering bracket
- 5 - Bolt

### Accessory Assembly Bracket - Tightening Sequence and Tightening Specification





- Tighten the bolts in the steps of the sequence shown:

| Step | Bolts    | Tightening Specification/Additional Turn |
|------|----------|--|
| 1    | -4-      | Install and tighten by hand              |
| 2    | -1 to 5- | Install and tighten by hand              |
| 3    | -1 to 5- | 20 Nm                                    |
| 4    | -1 to 5- | 90° additional turn                      |

## 1.2 Ribbed Belt, Removing and Installing

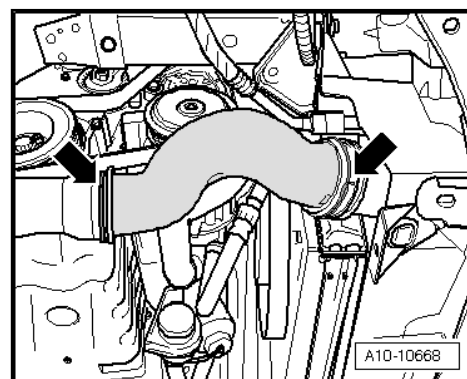
### Special tools and workshop equipment required

- ◆ Locking Pin -T10060A-

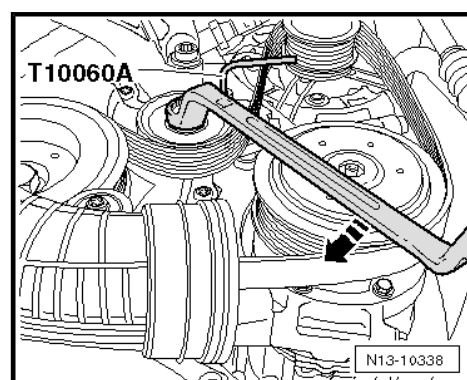
### Removing

Before removing the toothed belt, mark the running direction with chalk or a felt-tip pen for installation later.

- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50; Noise Insulation.
- Remove the right charge air hose -arrows-.



- To release the tension on the ribbed belt, turn the tensioner in direction of -arrow- from underneath.



- Secure the tensioner using the Locking Pin -T10060A-.
- Remove the ribbed belt.

### Installing

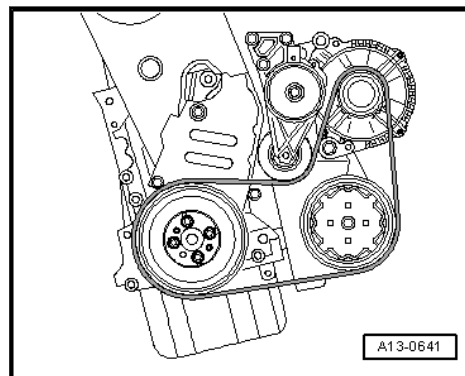
Install in reverse order of removal. Note the following:



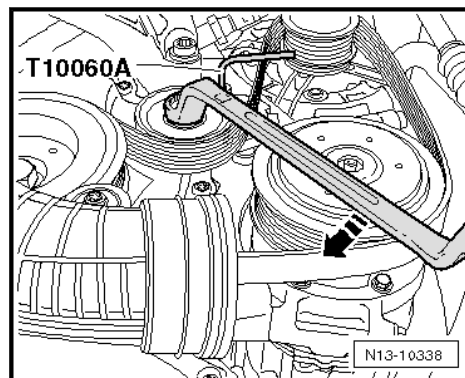
## Note

*Check to make sure the following components are secure before mounting the ribbed belts: the tensioner, generator and A/C compressor or bracket with idler roller.*

- Place the ribbed belts on the on the crankshaft, generator and A/C compressor belt pulleys.



- Turn the tensioner slightly with wrench in the direction of -arrow- and remove the Locking Pin -T10060A-.



- Release the tension on the tensioner.
- Check whether the ribbed belt is routed correctly.
- Start the engine and check whether the ribbed belt runs correctly.

## 1.3 Ribbed Belt Tensioner, Removing and Installing

### Special tools and workshop equipment required

- ◆ Engine Support Bridge -10-222A-
- ◆ Engine Support Bridge - Spindle -10-222A/11-
- ◆ Engine Support Bridge - Engine Support 28 -10-222A/28-
- ◆ Engine Support Bridge - Engine Support 31 -10-222A/31-
- ◆ Engine Support - Basic Set - Rail with Holes -T40091/2- from the Engine Support - Basic Set -T40091-
- ◆ Engine Support - Supplement Kit - Mount -T40093/5- from the Engine Support - Supplement Kit -T40093A-
- ◆ Engine Support Bridge - Engine Support 28-2 -10-222A/28-2-, quantity: 2

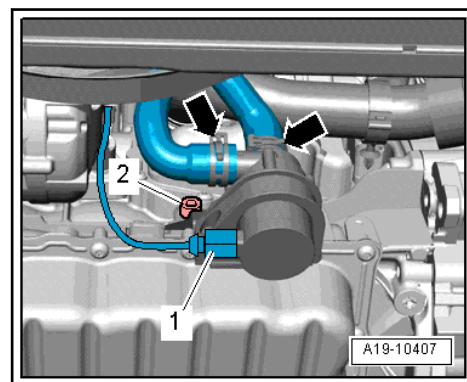




- ◆ Engine Support - Basic Set - Square Pipe -T40091/1- (quantity: 2) from the Engine Support - Basic Set -T40091-
- ◆ Engine Support - Basic Set - Movable Joint -T40091/3- (quantity: 2) from the Engine Support - Basic Set -T40091-
- ◆ Engine Support - Movable Joint -T40093/4- (quantity: 2) from the Engine Support - Supplement Kit -T40093A-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-

### Removing

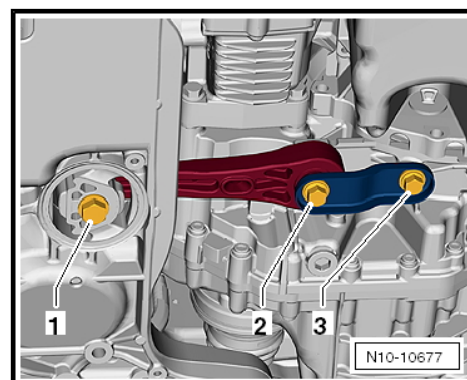
- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50; Noise Insulation.
- Remove the right front wheel.
- Remove the right wheel housing liner. Refer to ⇒ Body Exterior; Rep. Gr. 66; Wheel Housing Liner; Front Wheel Housing Liner, Removing and Installing.
- Remove the bolt -2- on the bracket for the After-Run Coolant Pump -V51-.



### Note

*The After-Run Coolant Pump -V51- stays in the installation position.*

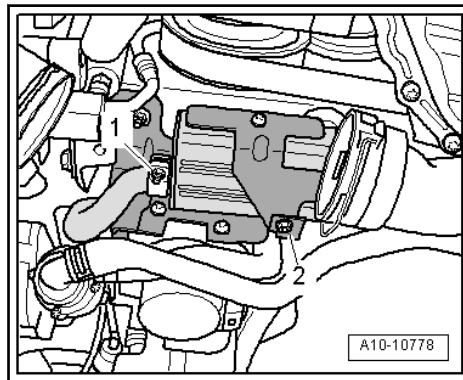
- First remove the bolt -1-.



- Then remove the bolts -2 and 3- and remove the pendulum support.

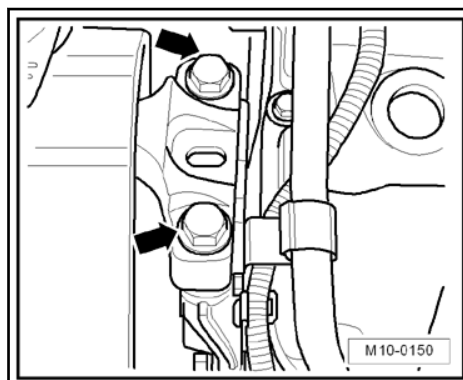
### Vehicles with Parking Heater:

- Loosen the clamp -1- and remove the bolt -2-.
- Remove the parking heater muffler.

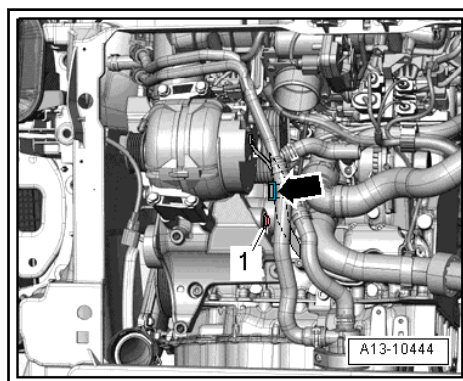


### Continuation for All Vehicles

- Remove the engine cover. Refer to [⇒ C3.1 over, Removing and Installing](#), page 37 .
- If equipped, remove the charge air guide to the sound generator.
- Remove the plenum chamber cover. Refer to ⇒ Body Exterior; Rep. Gr. 50; Plenum Chamber Cover; Plenum Chamber Cover, Removing and Installing.
- Support the engine in the installation position. Refer to [⇒ S2.3 upporting in Installation Position](#), page 29 .
- Remove the ribbed belt. Refer to [⇒ B1.2 elt, Removing and Installing](#), page 45 .
- Remove the subframe mount bolts -arrows- on the engine.



- Lower the engine approximately 55 mm.
- Free up the wiring harness -arrow-.
- Remove the bolt -1- and remove the ribbed belt tensioner from the accessory assembly bracket.

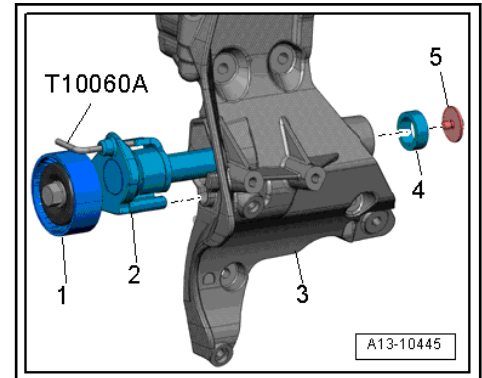




## Installing

Install in reverse order of removal. Note the following:

- Insert the ribbed belt tensioner -1- into the sub-assembly bracket -3-. Tighten the bolt -5-.



- ◆ Note the installation position of the support -2-: Insert the tabs on the support into the hole in the sub-assembly bracket.
- ◆ Pay attention to the centering sleeve -4-.
- Adjust the subframe mount. Refer to [⇒ M2.4 ount, Adjusting", page 33](#).

## Tightening Specifications

- ◆ Refer to [⇒ -1.1 Ribbed Belt Drive", page 42](#)
- ◆ Refer to [⇒ -2.1 Subframe Mount", page 22](#)

## 1.4 Vibration Damper, Removing and Installing

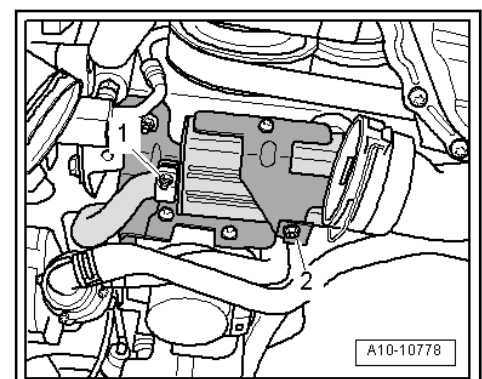
### Special tools and workshop equipment required

- ◆ Locking Pin -T10060A-
- ◆ Counterhold - Vibration Damper -T10355-

### Removing

- Remove the noise insulation. Refer to [⇒ Body Exterior; Rep. Gr. 50; Noise Insulation](#).
- Remove the right front wheel.
- Remove the right front wheel housing liner. Refer to [⇒ Body Exterior; Rep. Gr. 66; Wheel Housing Liner; Front Wheel Housing Liner, Removing and Installing](#).

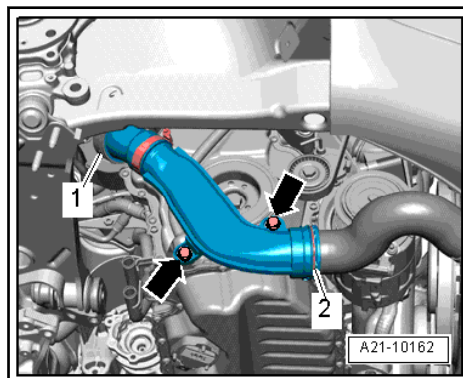
### Vehicles with Parking Heater



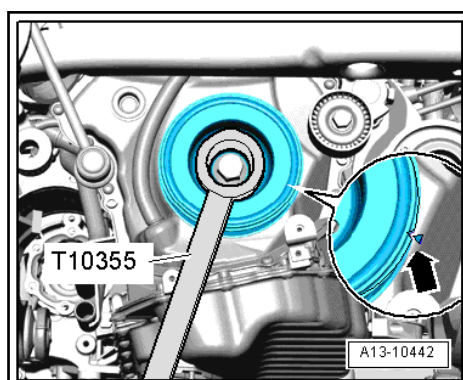


- Loosen the clamp -1- and remove the bolt -2-.
- Remove the parking heater muffler.

#### Continuation for All Vehicles



- Remove the bolts -arrows-.
- Remove the air duct pipe by lifting the clamps -1 and 2-.
- Remove the ribbed belt. Refer to [⇒ B1.2 elt, Removing and Installing](#), page 45 .
- Turn the vibration damper into “TDC” -arrow- using the Counterhold - Vibration Damper -T10355A-.



- The notch on the vibration damper must align with the arrow marking on the lower timing chain cover.

In order not to change the valve timing, the crankshaft must not be moved out of the “TDC” position when the vibration damper is removed.

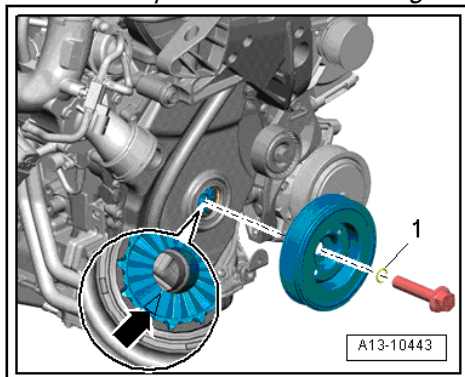
- Remove vibration damper bolt using the Counterhold - Vibration Damper -T10355A-.
- Remove the vibration damper.

#### Installing

Install in reverse order of removal. Note the following:

**Note**

Replace the vibration damper bolt with the O-ring -1-.



- Coat the sealing lip on the seal with engine oil.
- Mount the vibration damper; when doing this, pay attention to the tooth contour -arrow-.

**Tightening Specification**

- ◆ Refer to [⇒ -2.2 Charge Air System", page 283](#)
- ◆ Refer to [⇒ -1.1 Ribbed Belt Drive", page 42](#)

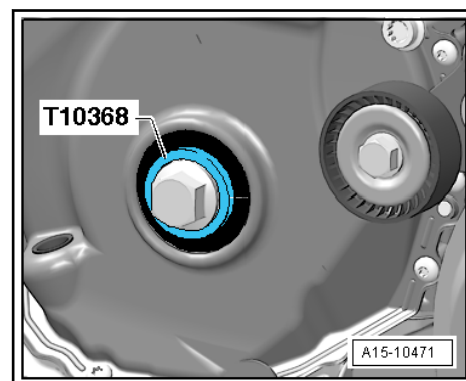
## 1.5 Vibration Damper Seal, Replacing

**Special tools and workshop equipment required**

- ◆ Seal Installer - Crankshaft -T10354-
- ◆ Puller - Crankshaft/Power Steering Seal - 2 -T20143/2-
- ◆ Press Piece - Timing Chain Cover -T10368- (not illustrated)

**Removing**

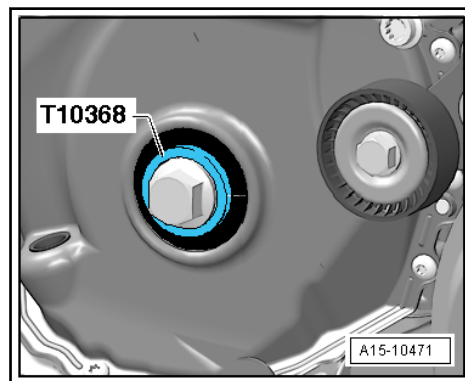
- Remove the vibration damper. Refer to [⇒ D1.4 amper, Removing and Installing", page 49](#) .
- Attach the Press Piece - Timing Chain Cover -T10368- for this.



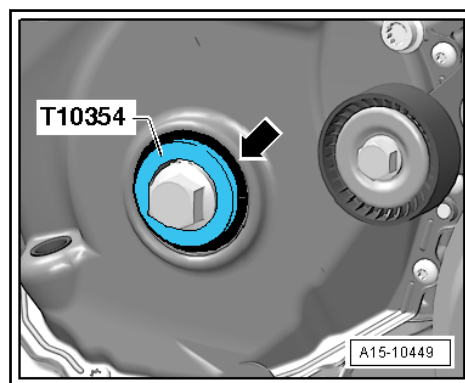
- Remove the seal with the Puller - Crankshaft/Power Steering Seal - 2 -T20143/2-

**Installing**

- Clean the contact and sealing surface.
- Remove the Press Piece - Timing Chain Cover -T10368-.

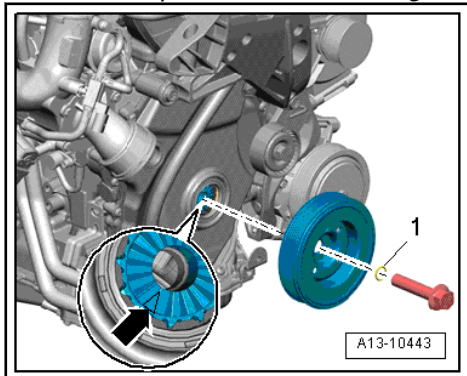


- Insert the seal -arrow- using the Seal Installer -Crankshaft -T10354- and the vibration damper bolt in all the way.



#### Note

Replace the vibration damper bolt with an O-ring -1-.



Further assembly is performed in the reverse order of the removal.

#### Tightening Specification

- ◆ Refer to ➤ [-1.1 Ribbed Belt Drive](#), page 42

## 1.6 Sub-Assembly Bracket, Removing and Installing

#### Special tools and workshop equipment required

- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Coolant additive -G 12 plus-plus-

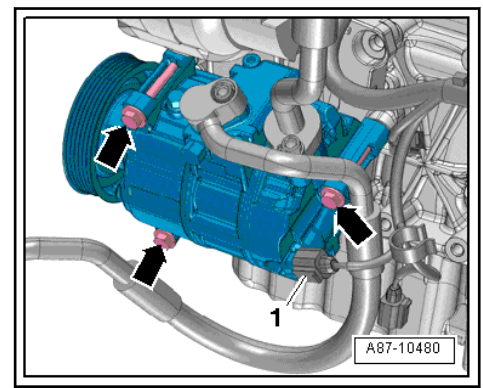


## Removing

- Drain the coolant. Refer to ⇒ [D1.3 draining and Filling](#)”, page 226 .
- Remove the ribbed belt. Refer to ⇒ [B1.2 elt, Removing and Installing](#)”, page 45 .
- If equipped, remove the charge air guide to the sound generator.
- Remove the Generator -C-. Refer to ⇒ Electrical Equipment; Rep. Gr. 27; Generator; Generator, Removing and Installing.
- Disconnect the connector from the oil pressure switch or from the oil pressure switches.

## Vehicles with A/C System:

- Disconnect the connector -1- from the A/C Compressor Regulator Valve -N280-.



- Remove the A/C compressor bolts -arrows-.

## WARNING

**Danger of frostbite from refrigerant.**

- Do not open the A/C system refrigerant circuit.

## Note

*Do not bend, twist or stretch the refrigerant lines and hoses.*

- Tie up the A/C compressor to the longitudinal member with the refrigerant hoses still connected.

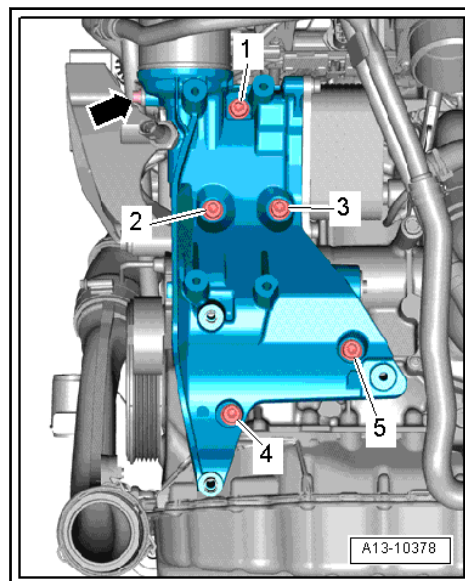
## Vehicles without A/C

- Remove the bracket and idler roller.

## Continuation for All Vehicles

- Remove the oil dipstick guide tube bolt -arrow-.





- Remove the bolts -5 through 1- and remove the accessory assembly bracket from the coolant pump housing.

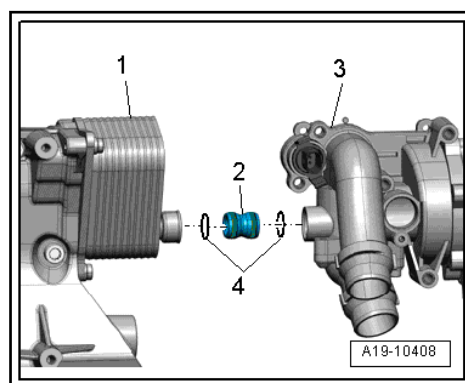
### Installing

Install in reverse order of removal. Note the following:



#### Note

- ♦ *Replace the bolts that were tightened with an additional turn.*
- ♦ *Replace the O-rings and seals.*
- Coat the new O-rings -4- with Coolant Additive -G 12 plus-plus-.



- Insert the connection -2- into the coolant pump housing -3-.
- Slide the sub-assembly bracket -1- onto the connection and then install and tighten the bolts. Refer to ➔ [Fig. "Accessory Assembly Bracket - Tightening Sequence and Tightening Specification", page 44](#) .

### Vehicles with A/C System

- Install the A/C compressor. Refer to ➔ Heating, Ventilation and Air Conditioning; Rep. Gr. 87.

### Vehicles without A/C

- Install the bracket with idler roller. Refer to ➔ [-1.1 Ribbed Belt Drive", page 42](#) .





### Continuation for All Vehicles

- Install the Generator -C-. Refer to ⇒ Electrical Equipment; Rep. Gr. 27; Generator; Generator, Removing and Installing.
- Install the ribbed belt. Refer to ⇒ [B1.2 elt, Removing and Installing", page 45](#) .
- Fill with coolant. Refer to ⇒ [D1.3 raining and Filling", page 226](#) .

### Tightening Specification

- ◆ Refer to ⇒ [-1.1 Ribbed Belt Drive", page 42](#)



## 2 Cylinder Block, Transmission Side

⇒ [-2.1 Cylinder Block, Transmission Side", page 56](#)

⇒ [R2.2 emoving and Installing", page 58](#)

⇒ [F2.3 lange, Removing and Installing, Transmission Side", page 60](#)

### 2.1 Overview - Cylinder Block, Transmission Side



### 1 - Cylinder Block

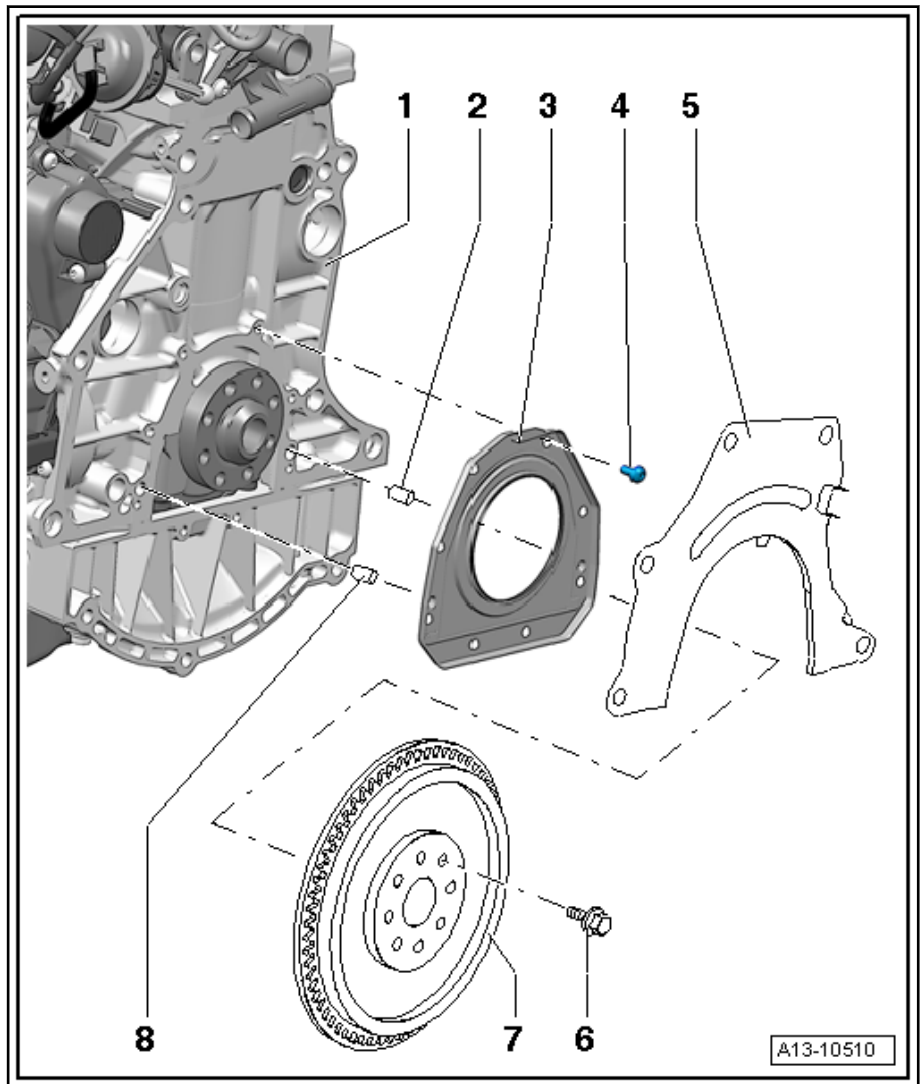
- ☐ Crankshaft, removing and installing. Refer to [⇒ -3.1 Crankshaft](#), page 68 .
- ☐ Piston and connecting rod, disassembling and assembling. Refer to [⇒ -4.1 Piston and Connecting Rod](#), page 77 .

### 2 - Alignment Pin

- ☐ Not installed

### 3 - Transmission Side Sealing Flange

- ☐ With gasket
- ☐ Only replace completely
- ☐ Before installing, remove oil residue from crankshaft journal with a clean cloth
- ☐ Do not oil or grease the sealing lip of seal
- ☐ To install, use the guide sleeve that was delivered.
- ☐ Guide sleeve may only be removed after the sealing flange has been slid onto the crankshaft pin.
- ☐ Removing and installing. Refer to [⇒ F2.3 Range, Removing and Installing, Transmission Side](#), page 60 .



### 4 - Bolt

- ☐ Tightening sequence and specification. Refer to [⇒ Fig. “Transmission-Side Sealing Flange, Tightening Sequence and Tightening Specification”](#), page 58 .

### 5 - Intermediate Plate

- ☐ Must rest on the alignment sleeves
- ☐ Be careful not to damage or bend when installing
- ☐ Engaged at sealing flange.

### 6 - Bolt

- ☐ 60 Nm +90° turn
- ☐ Replace after removing
- ☐ For the dual-mass flywheel

### 7 - Dual Mass Flywheel

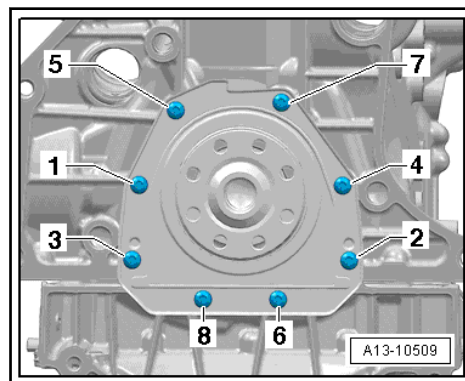
- ☐ Dual mass flywheel, removing and installing. Refer to [⇒ R2.2 Removing and Installing](#), page 58 .
- ☐ Only possible to install in one position (bores are offset)

### 8 - Alignment Pin

- ☐ Not installed



## Transmission-Side Sealing Flange, Tightening Sequence and Tightening Specification



- Tighten the bolts in the steps of the sequence shown:

| Step | Bolts    | Tightening Specification |
|------|----------|--------------------------|
| 1    | -1 to 8- | Tighten hand-tight       |
| 2    | -1 to 8- | 9 Nm                     |

## 2.2 Flywheel, Removing and Installing

### Special tools and workshop equipment required

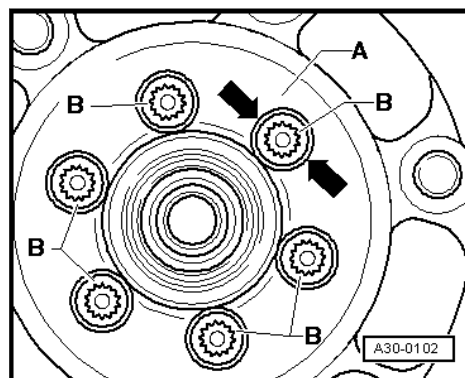
- ◆ Flywheel Retainer -3067-

### Removing

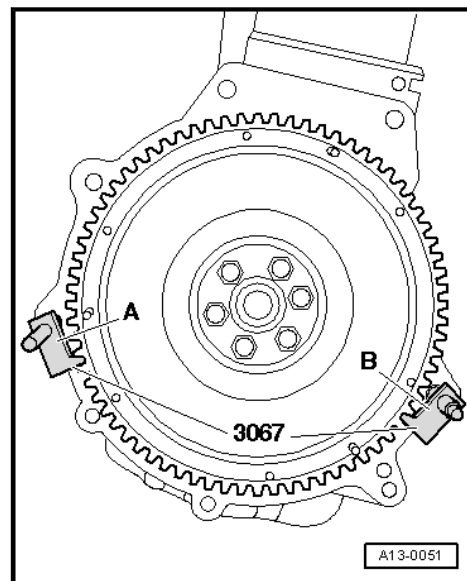
- Remove the transmission. Refer to ⇒ Rep. Gr. 34.

To prevent damage to the dual mass flywheel when removing, the bolts -B- must not be unscrewed using an air-powered or impact wrench. Always remove the bolt by hand only!

- Mark the dual-mass flywheel to the engine.
- Turn the dual mass flywheel -A- so the bolts -B- are centered to the holes -arrows-.



- When removing the bolts -B-, make sure the bolt head does not come in contact with the dual mass flywheel -arrows- which would be damaged if the flywheel is turned further.
- Insert the Flywheel Retainer -3067- into the hole on the cylinder block -B-.

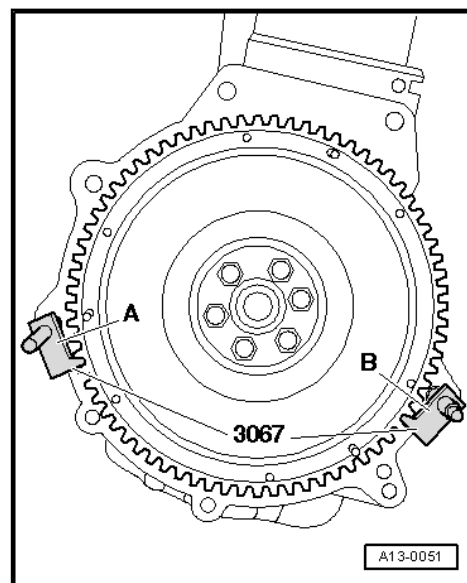


- Remove the dual mass flywheel by hand.

### Installing

Install in reverse order of removal. Note the following:

- Use new bolts.
- Insert the Flywheel Retainer -3067- into the hole on the cylinder block -A-.



### Tightening Specification

- ◆ Refer to ➔ [-2.1 Cylinder Block, Transmission Side](#), page 56

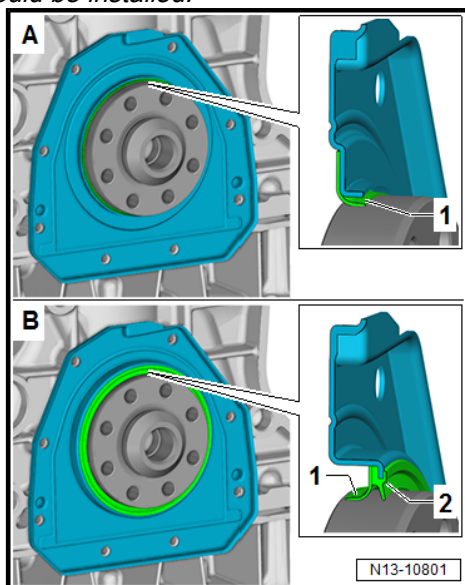


## 2.3 Sealing Flange, Removing and Installing, Transmission Side



### Note

*There are two versions of the sealing flange. Please check which sealing flange should be installed.*



- ◆ Version -A-: Sealing lip -1- faces the transmission (air side).
- ◆ Version -B-: Sealing lip -1- faces the engine (oil side). This sealing flange also has a dust lip -2-.

Version -A-, Removing and Installing. Refer to [⇒ S2.3.1 ide Sealing Flange, Removing and Installing, Version A \(Air Side Sealing Lip\)](#), page 60 .

Version -B-, Removing and Installing. Refer to [⇒ S2.3.2 ide Sealing Flange, Removing and Installing, Version B \(Oil Side Sealing Lip\)](#), page 64 .

### 2.3.1 Transmission Side Sealing Flange, Removing and Installing, Version A (Air Side Sealing Lip)

#### Special tools and workshop equipment required

- ◆ Seal Installer - Sealing Flange Guide Sleeve -T20097-
- ◆ Silicone Sealant. Refer to Parts Catalog
- ◆ Flat-Blade Scraper
- ◆ Hand Drill with Plastic Brush Attachment
- ◆ Protective Eyewear

#### Removing

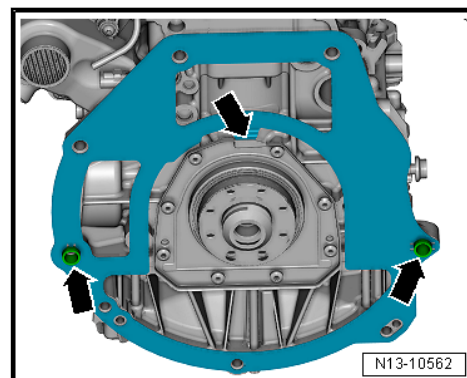
##### Conditions

- The transmission is removed.
- Dual-mass flywheel removed. Refer to [⇒ R2.2 emoving and Installing](#), page 58 .

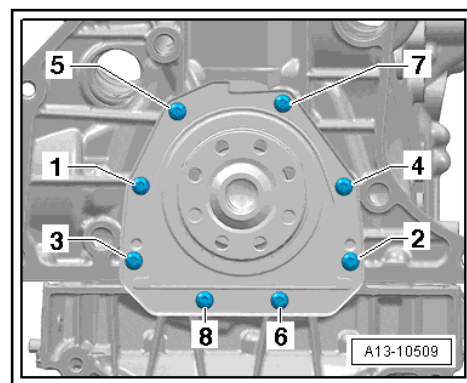


## Procedure

- Unhook the intermediate plate from the sealing flange and at the alignment sleeves -arrows-.



- Remove the bolts -1 through 8- and remove the transmission-side sealing flange.



## Installing



### Note

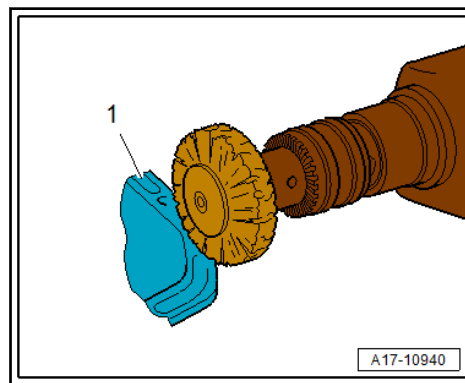
- ◆ Check the expiration date of the Silicone Sealant.
- ◆ The sealing flange must be installed within five minutes after applying the Silicone Sealant.
- ◆ To prevent contamination of the lubricating system with sealant residue, place a clean cloth over the open part of the oil pan.
- Remove any sealant residue on the cylinder block using a flat blade scraper.



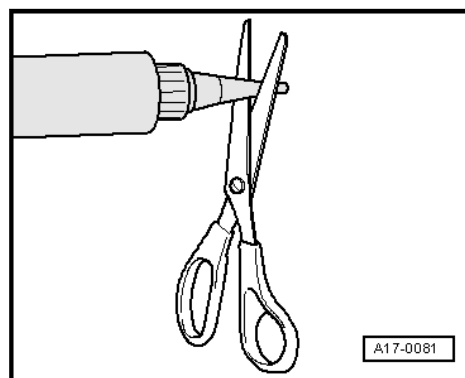
### WARNING

**Risk of injuring the eyes from sealant residue.**

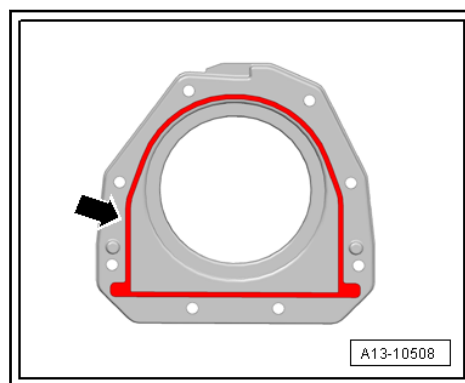
- Wear protective eyewear.
- Remove remaining sealant on sealing flange using for example a rotating plastic brush.



- Clean the sealing surfaces. They must be free of oil and grease.
- Remove any oil residue on the crankshaft journal with a clean cloth.
- Cut the tube nozzle at the front marking (nozzle diameter: approximately 2 mm).



- Apply silicone sealant on the clean sealing surface of the sealing flange as shown.

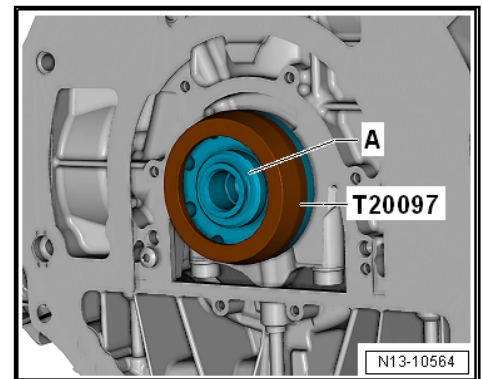


- Sealant bead thickness: 2 to 3 mm.

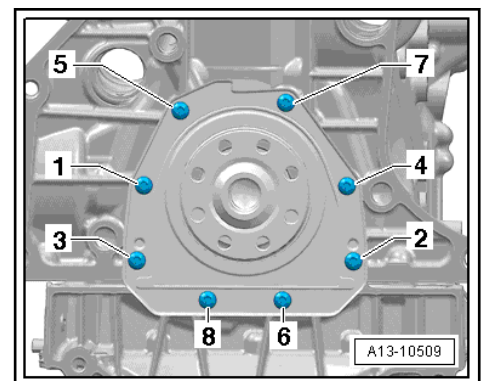


**Note**

- ◆ *The sealing flange must be installed within five minutes after applying the Silicone Sealant.*
- ◆ *The sealant bead may not be thicker than specified, otherwise excess sealant could enter the oil pan and clog the oil intake pipe screen.*
- ◆ *The -T20097- may only be removed after the sealing flange has been slid onto the crankshaft pin.*
- Clean the crankshaft journal carefully.



- Check the guide sleeve; it must not be widened, sharp-edged or dirty.
- Position the -T20097- on the crankshaft journal -A-.
- Slide the sealing flange over the -T20097- onto the crankshaft journal.
- Remove the -T20097-.
- Tighten the new bolts evenly in the sequence shown.

**Note**

*After installing the sealing flange, the sealant must dry for approximately 30 minutes. Only afterward may the engine oil be replenished.*

The rest of the assembly is performed in the reverse order of removal.



## Tightening Specification

- ◆ Refer to ⇒ [Fig. “Transmission-Side Sealing Flange, Tightening Sequence and Tightening Specification”](#), page 58

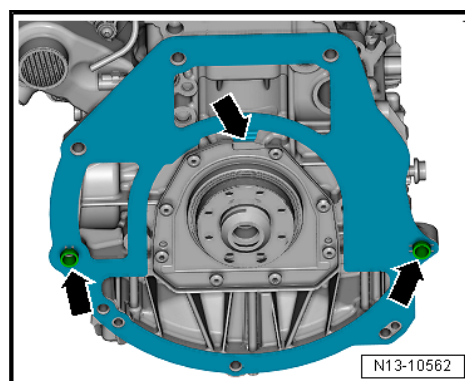
### 2.3.2 Transmission Side Sealing Flange, Removing and Installing, Version B (Oil Side Sealing Lip)

#### Special tools and workshop equipment required

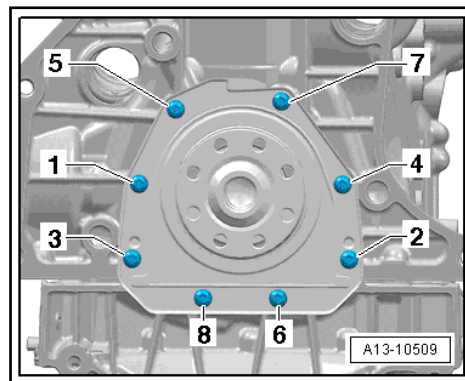
- ◆ Crank Shaft Seal Installer - Guide Piece -T10122/6- or - T10122/6A- from the Seal Installer - Crankshaft -T10122B- or - T10122C-
- ◆ Guide Piece to Crankshaft Seal Install Kit - Guide Piece -T10122/1- from the Seal Installer - Crankshaft -T10122B- or -T10122C-
- ◆ Hand Drill with Plastic Brush Attachment
- ◆ Protective Eyewear
- ◆ Refer to the Parts Catalog for the correct sealant.

#### Removing

- Transmission removed
- Dual-mass flywheel removed. Refer to ⇒ [R2.2 removing and Installing”](#), page 58 .
- Unhook the intermediate plate from the sealing flange and at the alignment sleeves -arrows-.



- Remove the bolts -1 through 8-.



- Pry out the sealing flange.



## Installing



### Note

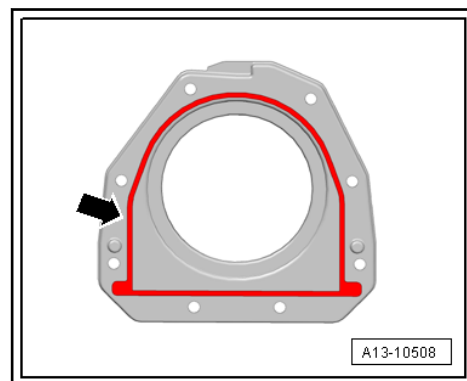
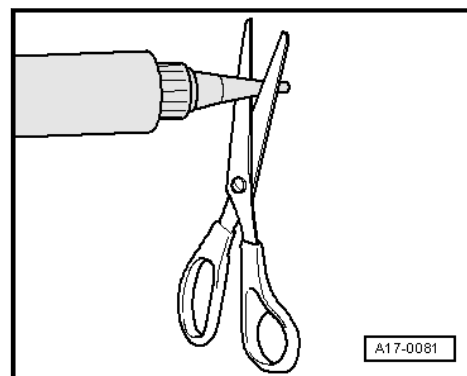
- ◆ Check the expiration date of the Silicone Sealant.
- ◆ The sealing flange must be installed within five minutes after applying the Silicone Sealant.
- ◆ To prevent contamination of the lubricating system with sealant residue, place a clean cloth over the open part of the oil pan.



### WARNING

**Risk of injuring the eyes from sealant residue.**

- Wear protective eyewear.
- Remove the sealant residue on the cylinder block using a flat-blade scraper or a rotating plastic brush.
- Clean the sealing surfaces. They must be free of oil and grease.
- Clean the crankshaft journal. When there is rust on the crankshaft journal, apply a thin coat of engine oil.
- Cut the tube nozzle at the front marking (nozzle diameter: approximately 2 mm).
- Apply silicone sealant to the clean sealing surface on the sealing flange as shown.

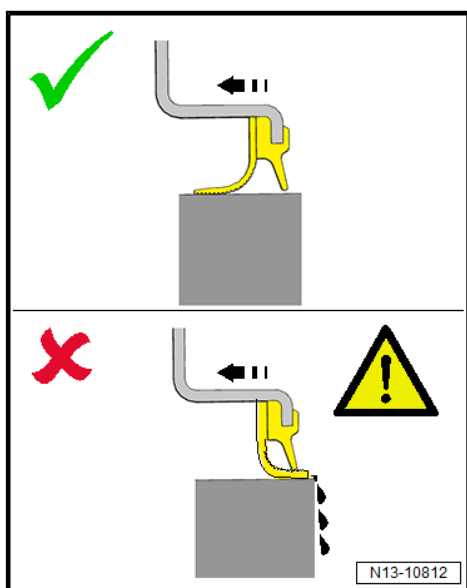


- Sealant bead thickness: 2 to 3 mm.

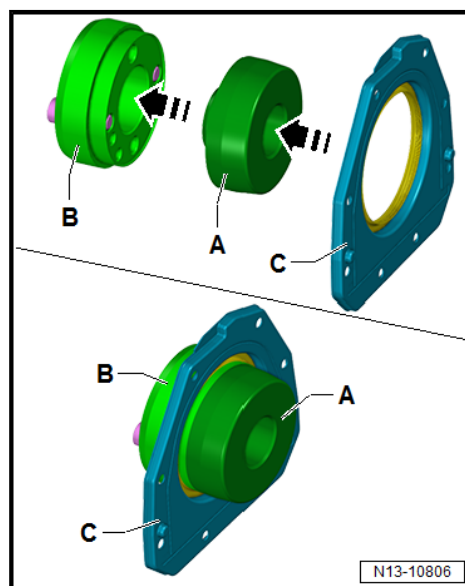


# Note

- ◆ The sealing flange must be installed within five minutes after applying the silicone sealant.
- ◆ The sealant bead may not be thicker than specified, otherwise excess sealant could enter the oil pan and clog the oil intake pipe screen.
- ◆ Check the sealing lip of the sealing flange, it must not be kinked or damaged.
- ◆ The sealing lip must be pointed to the engine after installing. If the sealing lip »folds« outward when installing, leaks will result.



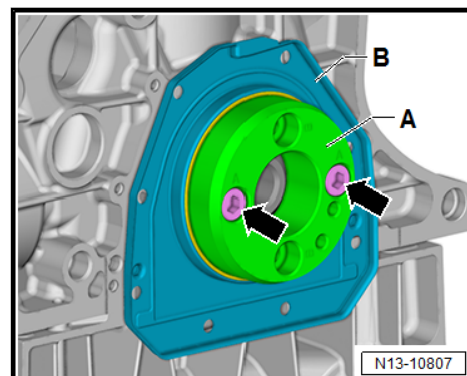
- Check the -T10122/6- -B-; it must not be tilted or contaminated.



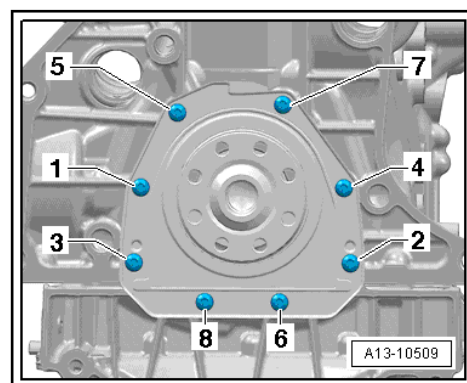
- Mount the -T10122/1- -A- on the -T10122/6- -B-.
- Slide the sealing flange -C- with the outer side first on the -T10122/6- -B-.



- Remove the -T10122/1- -A-.
- Insert the -T10122/6- -A- with the sealing flange -B- on the crankshaft journal.



- Tightening the bolts -arrows- is not necessary.
- Slide the Sealing Flange -B- over the -T10122/6- -A- on the crankshaft journal.
- Remove the -T10122/6- -A-.
- Tighten the new bolts evenly in the sequence shown.



### Note

*After installing the sealing flange, the sealant must dry for approximately 30 minutes. Only afterward may the engine oil be replenished.*

Further assembly is performed in the reverse order of the removal.

### Tightening Specification

- ◆ Refer to [⇒ Fig. “Transmission-Side Sealing Flange, Tightening Sequence and Tightening Specification”, page 58](#)



## 3 Crankshaft

⇒ [3.1 Crankshaft", page 68](#)

⇒ [D3.2 imensions", page 70](#)

⇒ [B3.3 earing Shells Allocation", page 71](#)

⇒ [N3.4 eedle Bearing, Replacing", page 72](#)

⇒ [M3.5 easuring Axial Clearance", page 74](#)

⇒ [M3.6 easuring Radial Clearance", page 74](#)

⇒ [W3.7 heel, Removing and Installing", page 75](#)

### 3.1 Overview - Crankshaft



#### Note

*When performing any assembly work, the engine must be secured to the assembly stand using the Engine and Gearbox Bracket -VAS6095A-. Refer to ⇒ [S1.3 ecurring to Engine and Transmission Holder", page 18](#).*



### 1 - Cylinder Block

- ☐ Cylinder bore, checking. Refer to [⇒ Fig. "Cylinder Bore, Checking", page 80](#).
- ☐ If the cylinder block is being replaced, then the cylinder block bearing shells must be allocated again. Refer to [⇒ B3.3 bearing Shells Allocation", page 71](#).
- ☐ Piston and cylinder dimensions. Refer to [⇒ page 82](#).

### 2 - Cylinder Block Bearing Shell

- ☐ With oil groove
- ☐ Do not interchange used bearing shells (mark them)
- ☐ Allocation of the crankshaft bearing shells (classification). Refer to [⇒ B3.3 bearing Shells Allocation", page 71](#).

### 3 - Crankshaft

- ☐ After removing, set it aside so that the sensor wheel -item 8- [⇒ Item 8 \(page 70\)](#) is not rested on and becomes damaged
- ☐ If the crankshaft is being replaced, then the bearing shells must be reallocated to the bearing cap. Refer to [⇒ B3.3 bearing Shells Allocation", page 71](#).
- ☐ Crankshaft, tightening sequence. Refer to [⇒ Fig. "Crankshaft - Tightening Sequence and Specification", page 70](#)
- ☐ Crankshaft needle bearings, replacing (vehicles with twin clutch transmission). Refer to [⇒ N3.4 needle Bearing, Replacing", page 72](#)
- ☐ Axial play, checking. Refer to [⇒ M3.5 measuring Axial Clearance", page 74](#).
- ☐ Radial play, checking. Refer to [⇒ M3.6 measuring Radial Clearance", page 74](#)
- ☐ Do not turn crankshaft when measuring radial play.
- ☐ Crankshaft dimensions. Refer to [⇒ D3.2 dimensions", page 70](#).

### 4 - Bearing Shell

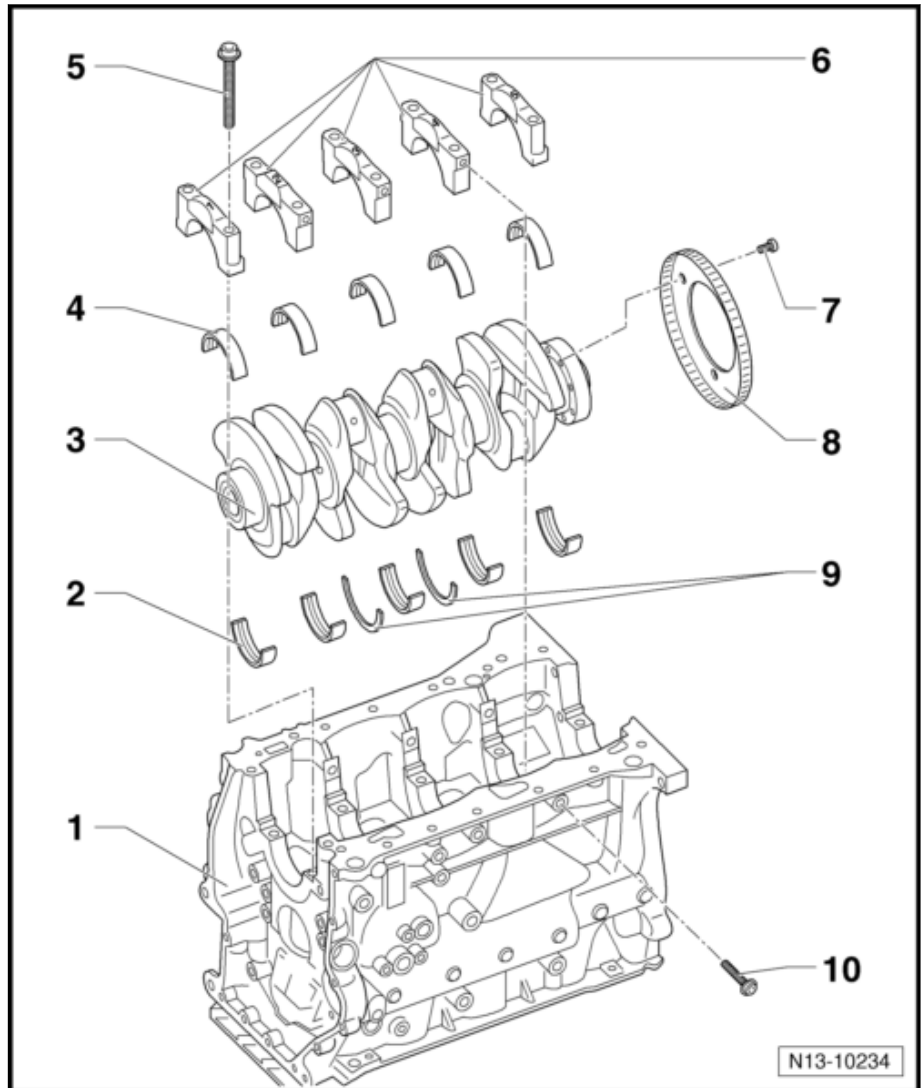
- ☐ Without oil groove
- ☐ Do not interchange used bearing shells (mark them)
- ☐ Allocation of the crankshaft bearing shells (classification). Refer to [⇒ B3.3 bearing Shells Allocation", page 71](#).

### 5 - Bolt

- ☐ Replace after removing
- ☐ Tightening sequence and specification. Refer to [⇒ Fig. "Crankshaft - Tightening Sequence and Specification", page 70](#).

### 6 - Bearing Cap

- ☐ Bearing cap 1: belt pulley side





- ❑ Retaining tabs for cylinder block/bearing cap bearing shells must lie above one another

#### 7 - Bolt

- ❑ 10 Nm +90° turn
- ❑ Replace after removing
- ❑ Replace the sensor wheel every time the bolts are loosened. Refer to [⇒ W3.7 heel, Removing and Installing", page 75](#) .

#### 8 - Sensor Wheel

- ❑ For the Engine Speed Sensor -G28-
- ❑ Only possible to install into one position, the holes are offset.
- ❑ Replace the sensor wheel every time the bolts are loosened. Refer to [⇒ W3.7 heel, Removing and Installing", page 75](#) .

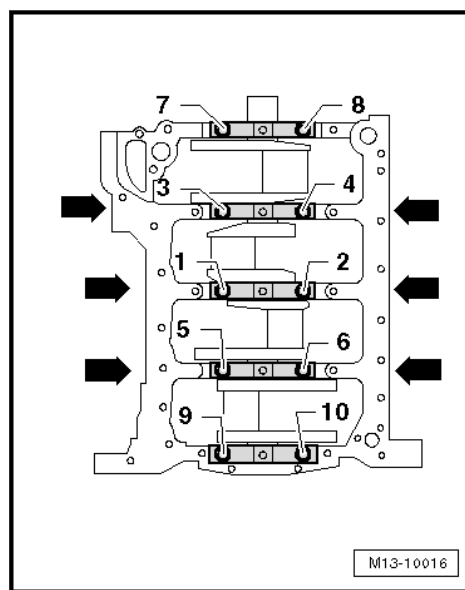
#### 9 - Thrust Washers

- ❑ For bearing 3

#### 10 - Bolt

- ❑ Replace after removing
- ❑ Tightening sequence. Refer to [⇒ Fig. ""Crankshaft - Tightening Sequence and Specification""](#), page [70](#) .

### Crankshaft - Tightening Sequence and Specification



- Tighten bolts -1 through 10- in the following steps:

| Step | Bolts          | Tightening Specification/Additional Turn |
|------|----------------|--|
| 1    | -1 through 10- | Install by hand all the way              |
| 2    | -1 through 10- | 65 Nm                                    |
| 3    | -1 through 10- | 90° additional turn                      |
| 4    | -arrows-       | 20 Nm                                    |
| 5    | -arrows-       | 90° additional turn                      |

## 3.2 Crankshaft Dimensions

(Dimensions in mm)





| Honing Dimension<br>1) | Crankshaft Bearing<br>Pin Diameter | Connecting Rod<br>Bearing Pin Diameter |
|------------------------|------------------------------------|--|
| Standard dimension     | 58.00                              | 47.80                                  |

1) The preparation of worn crankshafts is not provided.

### 3.3 Main Bearing Shells Allocation

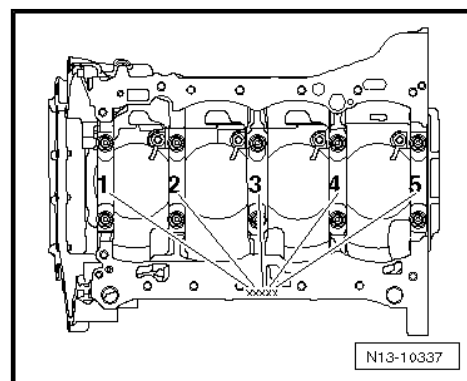
The bearing shells are allocated to the cylinder block with the correct thickness at the factory. Colored dots are used to identify the bearing shell thickness.

The letters on the lower sealing surface or on the front side of the cylinder block indicate which bearing shell must be inserted at which position in the cylinder block (upper bearing shell).

The letters on the crankshaft indicate which bearing shell must be inserted at which position in the bearing cap (lower bearing shell).

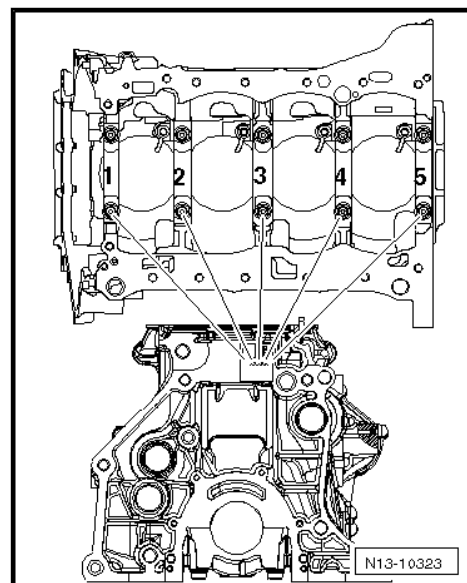
The first letter is for bearing cap one, the second for bearing cap two, etc.

#### Cylinder Block



The identification of the cylinder block may be located either on the oil pan sealing surface or on the top (transmission side) of the cylinder block.

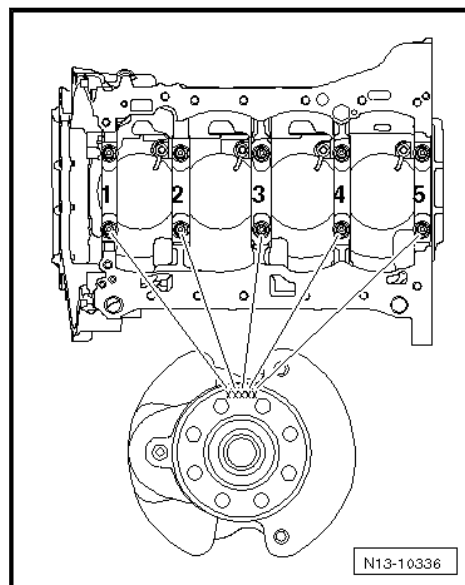
The identification on the cylinder block is for the upper bearing shell (cylinder block bearing shell).





- Note the code and select the color identification to be installed. Refer to [⇒ page 72](#)

### Crankshaft



The identification on the crankshaft is for the lower bearing shell (bearing cap bearing shell)

- Note the code and select the color identification to be installed. Refer to [⇒ page 72](#)

### Color Identification

- S = black
- R = red
- G = yellow
- B = blue
- W = white

## 3.4 Crankshaft Needle Bearing, Replacing

### Special tools and workshop equipment required

- ◆ Puller - Kukko Internal - 14-19mm -21/2- and Puller - Kukko Counterstay -22/1-
- ◆ Alignment Tool - Clutch Plate -3176-
- ◆ Bearing Installer - Bearing Press Piece -VW207C-



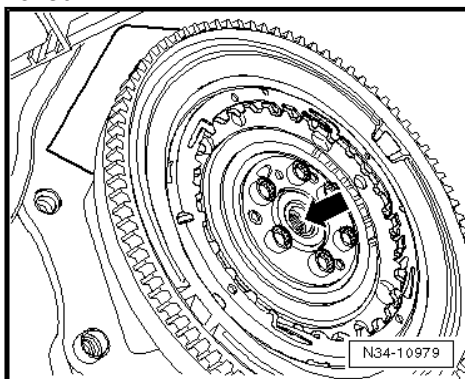
## Only Vehicles with a DSG® Transmission

### Special Tools and Equipment



#### Note

*Always replace the needle bearing -arrow- if the engine or the transmission is being removed.*

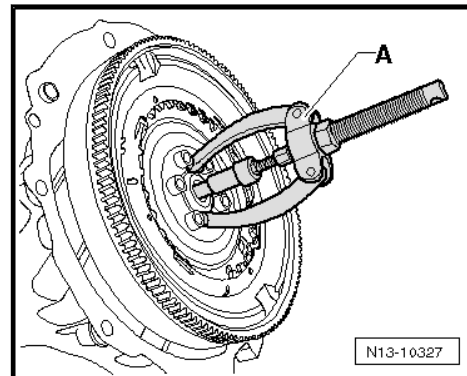


### Procedure

- The transmission is unflanged from the engine

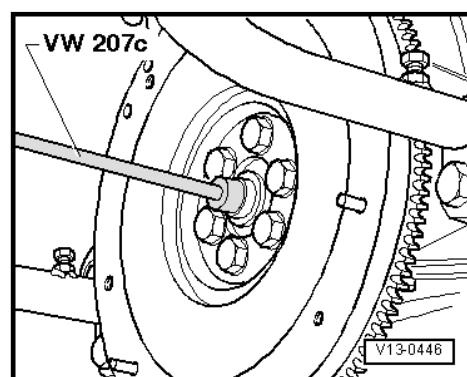
Remove the needle bearing:

- Remove with a commercially available puller -A-, for example Puller - Kukko Internal - 14-19mm -21/2- and Puller - Kukko Counterstay -22/1-.



### Installing

- Needle bearing with Bearing Installer - Bearing Press Piece -VW207C- or with Alignment Tool - Clutch Plate -3176-.



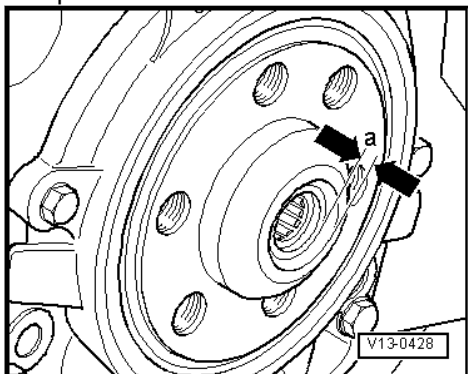
- Carefully install the needle bearing.



- Measure the installation depth constantly while installing.

#### Replace Bearings That Have Been Installed Too Deep.

- Installation depth: dimension -a- = 1.5 to 1.8 mm.

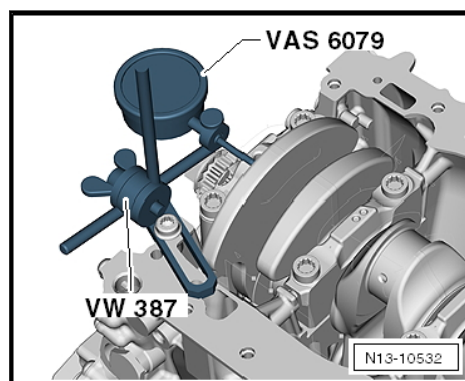


### 3.5 Crankshaft, Measuring Axial Clearance

#### Special tools and workshop equipment required

- ◆ Dial Gauge Holder -VW387-
- ◆ Dial Gauge - 0-10mm -VAS6079-

#### Test Sequence



- Attach the Dial Gauge - 0-10mm -VAS6079- with the Dial Gauge Holder -VW387- to the cylinder block and set against the crankshaft counterweight.
- Press the crankshaft against the dial gauge by hand and set the dial gauge to "0".
- Remove the crankshaft from the dial gauge and read the measurement.

Axial clearance:

- New: 0.07 to 0.23 mm.
- Wear limit: 0.30 mm.

### 3.6 Crankshaft, Measuring Radial Clearance

#### Special tools and workshop equipment required

- ◆ Plastigage®

#### Conditions

- Do not turn the crankshaft when checking the radial clearance.



## Test Sequence



### Note

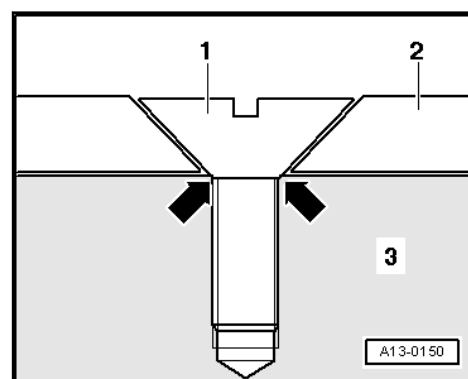
- ◆ *Do not interchange used bearings*
- ◆ *Bearing shells that are worn down to the nickel layer must be replaced.*
- Remove the main bearing shells and clean the bearing cap and pins.
- Place the Plastigage® over the entire bearing width of the pin or in the bearing shells.
- Plastigage® must rest in the center of the bearing shell.
- Position the main bearing shells and tighten it to 60 Nm. Do not rotate the crankshaft when doing so.
- Remove the main bearing shells again.
- Compare width of Plastigage® with calibrated scale.

Radial clearance:

- New: 0.017 to 0.037 mm.
- Wear limit: 0.15 mm.

## 3.7 Sensor Wheel, Removing and Installing

- Remove the engine. Refer to [⇒ R1.1 emoving", page 7](#) .
- Remove the transmission side sealing flange. Refer to [⇒ F2.3 lange, Removing and Installing, Transmission Side", page 60](#) .
- Remove the oil pan upper section. Refer to [⇒ P1.4 an Upper Section, Removing and Installing", page 197](#) .
- Remove the balance shaft drive chain. Refer to [⇒ S3.4 haft Drive Chain, Removing and Installing", page 146](#) .
- Remove the connecting rod bearing cap -item 2- [⇒ Item 2 \(page 78\)](#)
- Remove the crankshaft bearing cap -item 6- [⇒ Item 6 \(page 69\)](#) .
- Remove the crankshaft and the sensor wheel.
- Always replace the sensor wheel -2- after every time the bolts -1- are loosened.





#### Note

- ◆ *After tightening a second time, the attachment point of the countersunk bolts in the sensor wheel is so deformed that the bolt heads are at the crankshaft -3- -arrows- and the sensor wheel is loose under the bolts.*
- ◆ *Installation of the sensor wheel is only possible in one position (the holes are shifted).*

#### Tightening Specification

- ◆ Refer to ⇒ [-3.1 Crankshaft", page 68](#)



## 4      **Pistons and Connecting Rod**

⇒ [4.1 Piston and Connecting Rod", page 77](#)

⇒ [4.2 nd Cylinder Bore, Checking", page 79](#)

⇒ [4.3 onnecting Rod, Separating", page 82](#)

### 4.1      **Overview - Piston and Connecting Rod**



### 1 - Connecting Rod Bolt

- ☐ 45 Nm +90° turn
- ☐ Replace after removing
- ☐ Use the old bolt to measure the radial clearance
- ☐ Do not tighten further than 90° when measuring radial clearance
- ☐ Lubricate the threads and contact surface.

### 2 - Connecting Rod Bearing Cap

- ☐ Note the installation position
- ☐ Mark the cylinder to which it belongs -A-
- ☐ Installation position: the marks -B- face the belt pulley side
- ☐ Due to the separation procedure (cracking) of the connecting rod, the cap only fits in one position and only to the corresponding connecting rod.
- ☐ New connecting rod, separating. Refer to [C4.3 onnecting Rod, Separating](#), page 82 .

### 3 - Bearing Shells

- ☐ Note the installation position. Refer to [Fig. "Bearing Shell Installation Position"](#), page 81 .

- ☐ Do not interchange used bearing shells (mark them)
- ☐ New axial play: 0.10 to 0.35 mm

Wear limit: 0.4 mm

- ☐ Measure the radial clearance with a Plastigage®.

New: 0.020 to 0.060 mm

Wear limit: 0.090 mm

Do not turn crankshaft when measuring radial play.

### 4 - Relief Valve

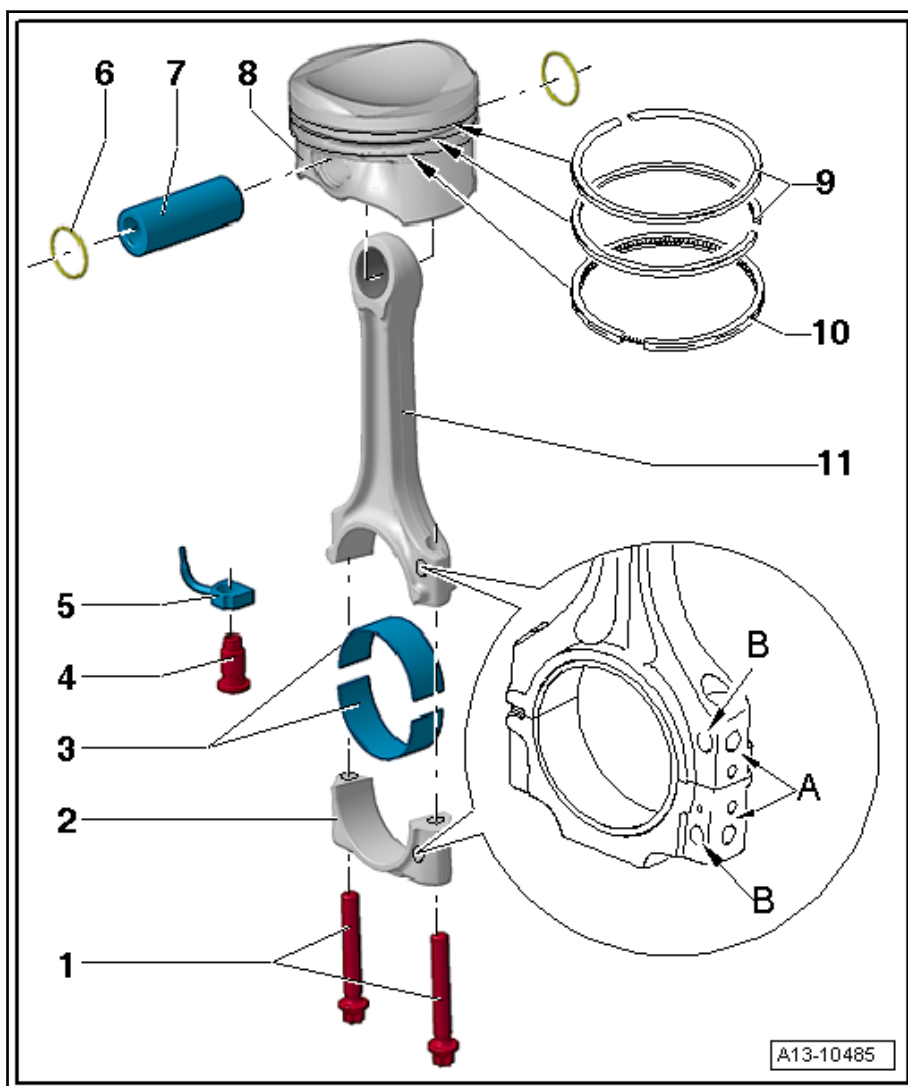
- ☐ 27 Nm
- ☐ Opening pressure: 1.6 to 1.9 bar (23.2 to 27.55 psi)

### 5 - Oil Spray Jet

- ☐ For piston cooling
- ☐ Observe the notes. Refer to [page 193](#) .

### 6 - Circlip

### 7 - Piston Pin







- ☐ If difficult to move, warm the piston up to approximately 60 °C (140 °F)
- ☐ Remove and install using the Pilot Drift -VW222A-

### 8 - Piston

- ☐ Mark the installed position and cylinder allocation
- ☐ Arrow on piston crown points toward belt pulley side
- ☐ Install with mounting strap piston ring
- ☐ Checking. Refer to [⇒ Fig. “Pistons, Checking”, page 80](#) .
- ☐ Cylinder bore, checking. Refer to [⇒ Fig. “Cylinder Bore, Checking”, page 80](#) .
- ☐ Piston and cylinder dimensions. Refer to [⇒ page 82](#) .

### 9 - Compression Rings

- ☐ Offset gaps by 120°
- ☐ Use piston ring pliers for removing and installing
- ☐ “TOP” mark must face up toward piston crown
- ☐ Ring gap, checking. Refer to [⇒ Fig. “Piston Ring Gap, Checking”, page 79](#) .
- ☐ Checking the groove clearance. Refer to [⇒ Fig. “Piston Ring Groove Clearance, Checking”, page 80](#) .

### 10 - Oil Scraping Ring

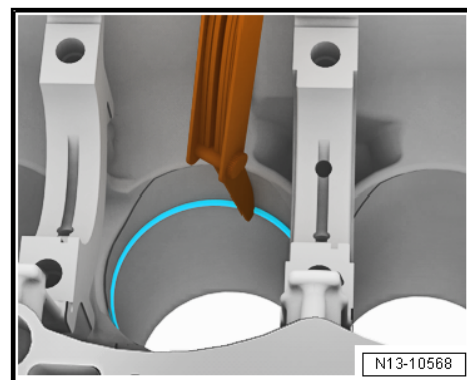
- ☐ Two-part
- ☐ Install upper steel ring so gap is offset by 120° to neighboring compression ring
- ☐ Offset all oil scraping ring component gaps to each other
- ☐ Ring gap, checking. Refer to [⇒ Fig. “Piston Ring Gap, Checking”, page 79](#) .
- ☐ Height clearance cannot be measured

### 11 - Connecting Rod

- ☐ Always replace as a set
- ☐ Mark the cylinder to which it belongs -A-
- ☐ Installation position: the marks -B- face the belt pulley side
- ☐ New connecting rod, separating. Refer to [⇒ C4.3 onnecting Rod, Separating”, page 82](#) .

## 4.2 Piston and Cylinder Bore, Checking

### Piston Ring Gap, Checking



### Special tools and workshop equipment required

- ◆ Feeler Gauge

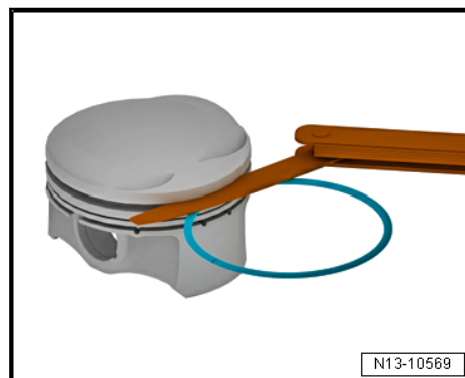
### Test Sequence

- Push ring squarely from above down to approximately 15 mm from bottom end of cylinder. To push in use a piston without rings.



| Piston Ring       | Ring Gap     |            |
|-------------------|--------------|------------|
|                   | New          | Wear limit |
| Dimensions in mm  |              |            |
| Compression Rings | 0.20 to 0.40 | 0.80       |
| Oil Scraping Ring | 0.25 to 0.50 | 0.80       |

### Piston Ring Groove Clearance, Checking



### Special tools and workshop equipment required

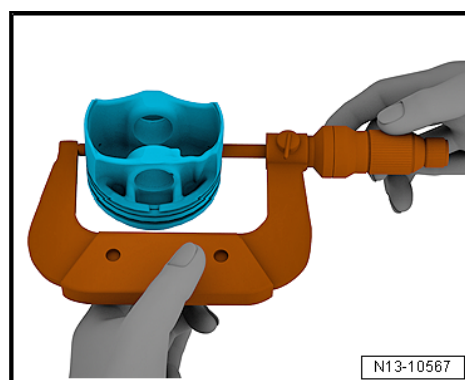
- ◆ Feeler Gauge

### Test Sequence

- Clean the piston ring groove before checking.

| Piston Ring          | Ring to Groove Clearance |            |
|----------------------|--------------------------|------------|
|                      | New                      | Wear limit |
| Dimensions in mm     |                          |            |
| 1st Compression ring | 0.06 to 0.09             | 0.20       |
| 2nd Compression ring | 0.03 to 0.06             | 0.15       |
| Oil Scraping Ring    | Cannot be measured       |            |

### Pistons, Checking



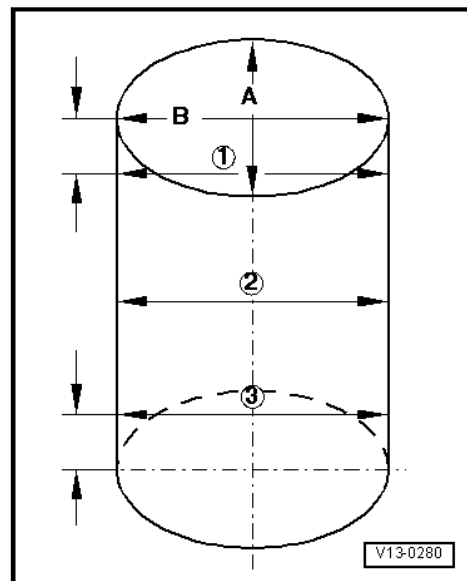
### Special tools and workshop equipment required

- ◆ Outside Micrometer - 75-100mm -VAS6071-

### Test Sequence

- Measure approximately 10 mm from the lower edge and offset by 90° to the piston pin axis.
- Deviation from specified size: maximum 0.04 mm

### Cylinder Bore, Checking



### Special tools and workshop equipment required

- ◆ Cylinder Dial Bore Gauge -VAS6078-

#### CAUTION

Risk of damaging the cylinder bore surface through incorrect handling.

- Never handle the cylinder bore with service equipment (drilling, honing, grinding).

### Test Sequence

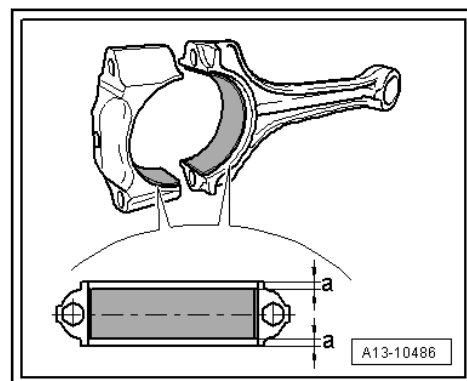
- Measure diagonally at three positions laterally -A- and longitudinally -B-.
- Deviation from nominal dimension: maximum 0.08 mm



#### Note

*The cylinder bore must not be measured when the cylinder block is mounted on the Engine and Transmission Holder - VAS6095- because the measurements may be incorrect.*

### Bearing Shell Installation Position



- Place the bearing shells centrally into connecting rod and connecting rod bearing cap.
- The dimension -a- must be the same at left and right.



## Piston and Cylinder Dimensions

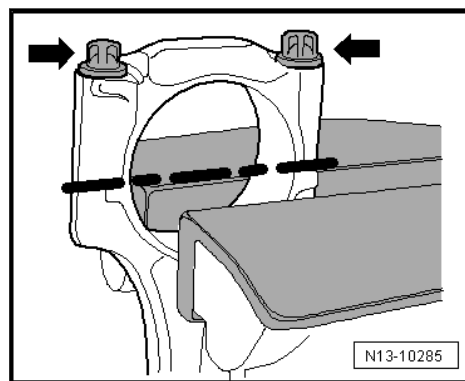
| Honing Dimension   | Piston and Cylinder Dimensions  |  |
|--------------------|---------------------------------|--|
| Dimensions in mm   | Piston diameter <sup>2)</sup> . | Cylinder bore diameter <sup>2)</sup> . |
| Standard dimension | 82.465                          | 82.510                                 |

2) Dimensions without graphite coating (0.020 mm thick). The graphite coating wears off.

## 4.3 New Connecting Rod, Separating

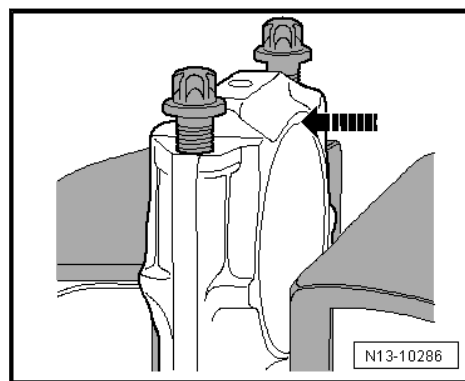
A new connecting rod might not be separated all the way at the predetermined breaking point. If the connecting rod bearing cap cannot be removed by hand, proceed as follows:

- Label which cylinder goes with the connecting rod -item 11- ➔ [Item 11 \(page 79\)](#) .
- Place the connecting rod -see illustration- in a vise with aluminum protective pads.



### Note

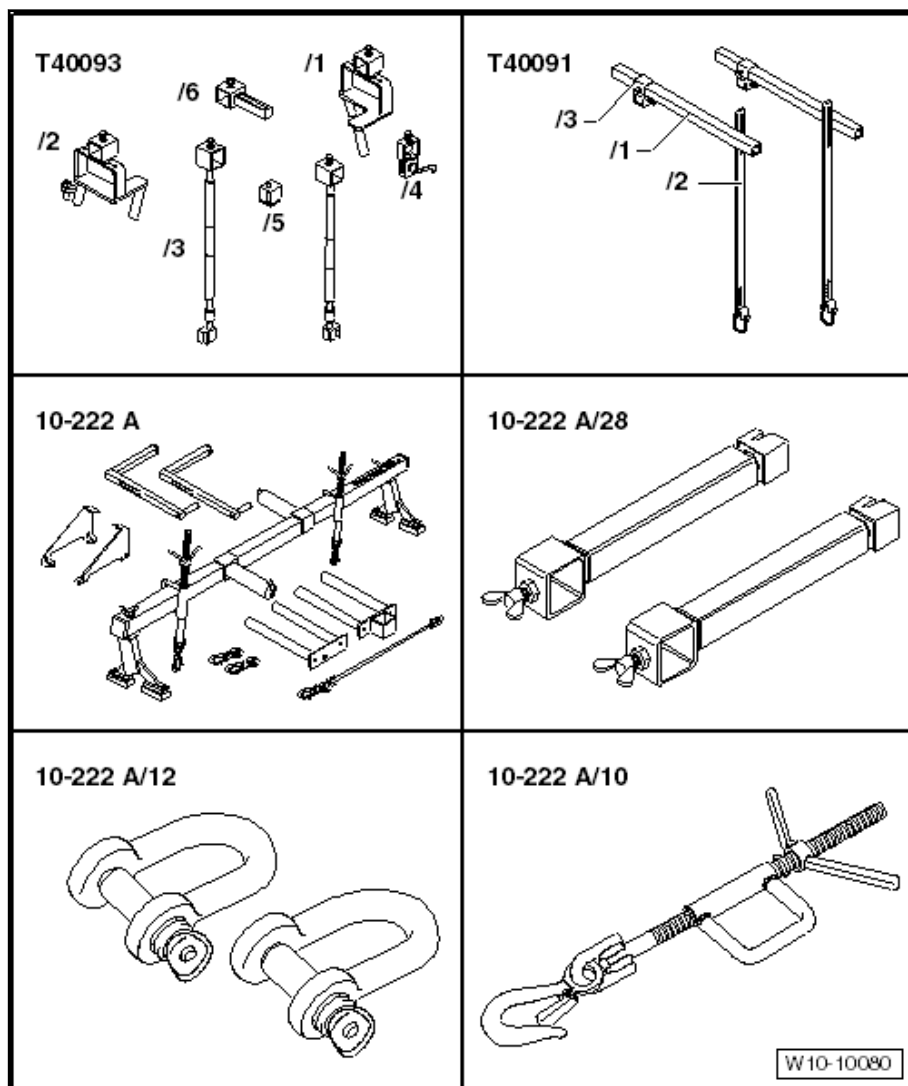
- ◆ *Clamp the connecting rod lightly to prevent damaging it.*
- ◆ *Clamp the connecting rod below the dotted line.*
- Remove both bolts -arrows- approximately five turns.
- Carefully tap against the connecting rod bearing cap in the direction of -arrow- with a plastic hammer until the cap is loose.





## 5 Special Tools

Special tools and workshop equipment required



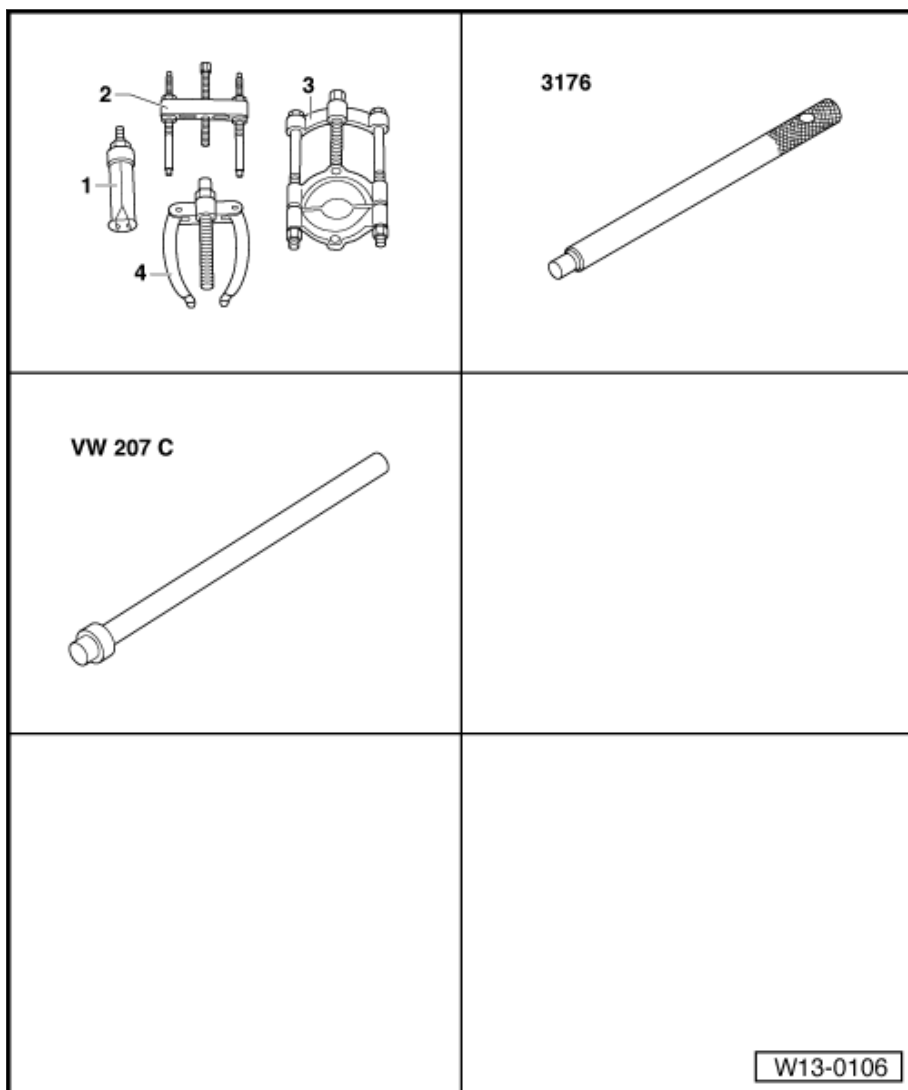
- ◆ Engine Support Bridge -10-222A-
- ◆ Engine Support Bridge - Spindle -10-222A/11-
- ◆ Engine Support Bridge - Engine Support 28 -10-222A/28-
- ◆ Engine Support Bridge - Engine Support 31 -10-222A/31-
- ◆ Engine Support - Basic Set - Rail with Holes -T40091/2- from the Engine Support - Basic Set -T40091-
- ◆ Engine Support - Supplement Kit - Mount -T40093/5- from the Engine Support - Supplement Kit -T40093A-
- ◆ Engine Support Bridge - Engine Support 28-2 -10-222A/28-2-, quantity: 2
- ◆ Engine Support - Basic Set - Square Pipe -T40091/1- (quantity: 2) from the Engine Support - Basic Set -T40091-
- ◆ Engine Support - Basic Set - Movable Joint -T40091/3- (quantity: 2) from the Engine Support - Basic Set -T40091-
- ◆ Engine Support - Movable Joint -T40093/4- (quantity: 2) from the Engine Support - Supplement Kit -T40093A-



1 - -1- Puller - Kukko Internal -  
14-19mm -21/2-and -4- Puller  
- Kukko Counterstay -22/1-

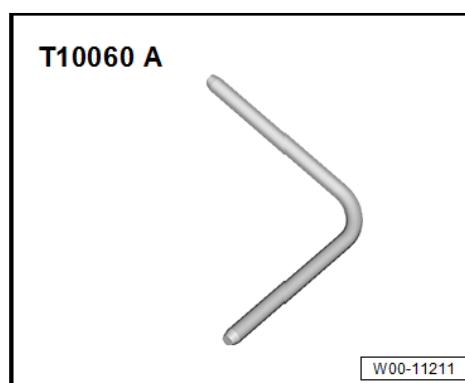
2 - Alignment Tool - Clutch  
Plate -3176-

3 - Bearing Installer - Bearing  
Press Piece -VW207C-



W13-0106

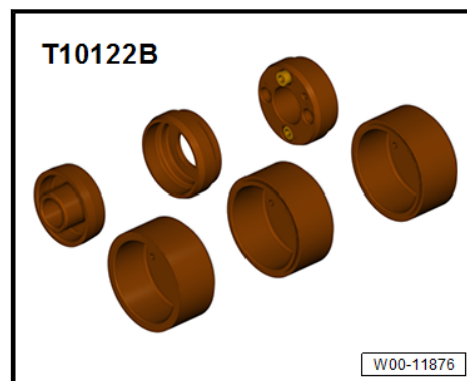
◆ Locking Pin -T10060A-



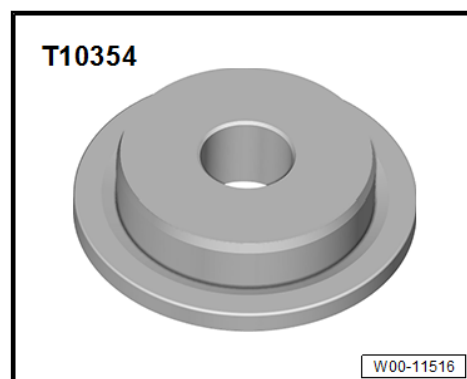
W00-11211



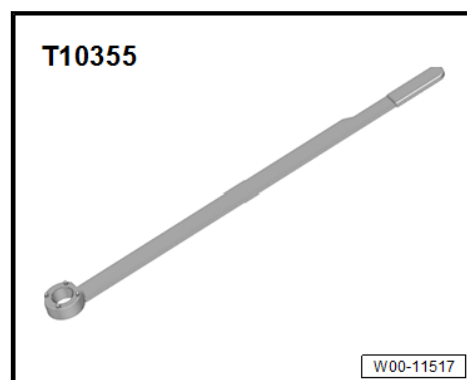
- ◆ Crankshaft Seal Installer Kit -T10122B- or Assembly Device -T10122C-



- ◆ Seal Installer - Crankshaft -T10354-



- ◆ Counterhold - Vibration Damper -T10355-

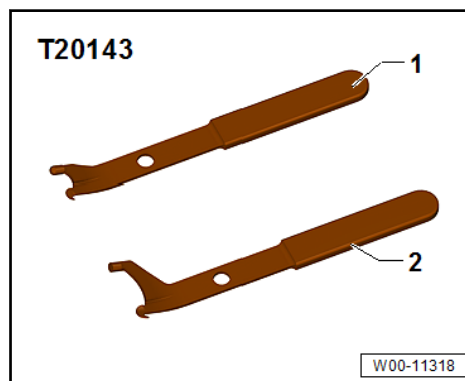


- ◆ Seal Installer - Sealing Flange Guide Sleeve -T20097-

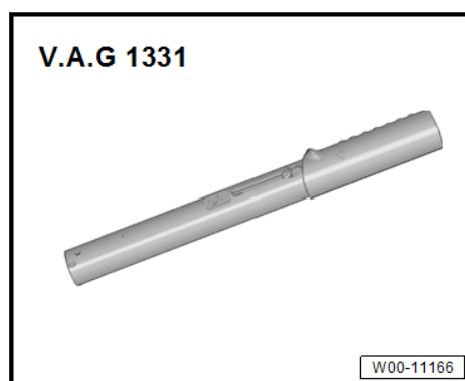




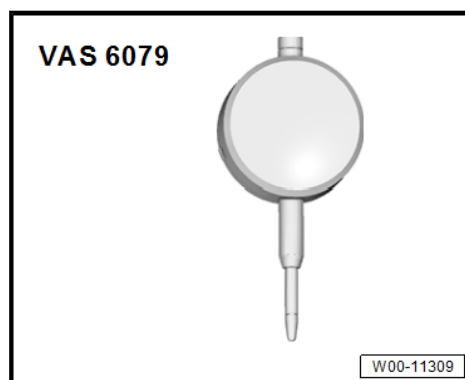
- ◆ Puller - Crankshaft/Power Steering Seal - 2 -T20143/2-



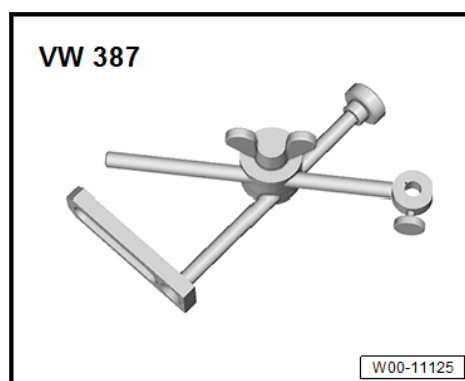
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-



- ◆ Dial Gauge - 0-10mm -VAS6079-



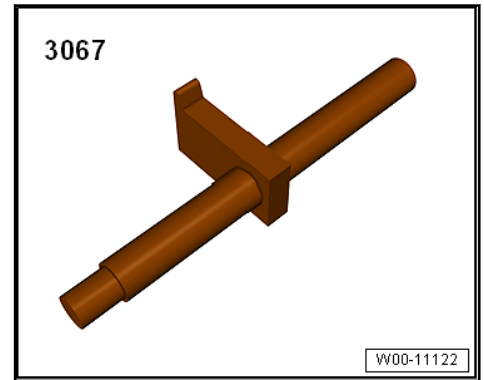
- ◆ Dial Gauge Holder -VW387-







◆ Flywheel Retainer -3067-



◆ Press Piece - Timing Chain Cover -T10368- (not illustrated)



## 15 – Cylinder Head, Valvetrain

### 1 Cylinder Head

⇒ [-1.1 Cylinder Head", page 88](#)

⇒ [H1.2 ead, Removing and Installing", page 92](#)

⇒ [P1.3 ump, Removing and Installing", page 111](#)

⇒ [C1.4 hecking", page 112](#)

#### 1.1 Overview - Cylinder Head



##### Note

- ◆ *Replace the cylinder head bolts.*
- ◆ *Always replace self-locking nuts, bolts which have been tightened to tightening specification as well as gaskets and seals.*
- ◆ *The plastic protectors installed to protect the open valves must only be removed immediately before fitting the cylinder head.*
- ◆ *When replacing the cylinder head or cylinder head gasket, the coolant must be completely replaced.*

**1 - Cylinder Head Gasket**

- ☐ Replace after removing
- ☐ Pay attention to the installation position: the part number must be visible from the intake side

**2 - Bolt**

- ☐ 25 Nm

**3 - Transport Strap****4 - Bolt**

- ☐ Replace after removing
- ☐ Follow the sequence when loosening. Refer to ⇒ [Fig. "Loosen Cylinder Head", page 91](#)
- ☐ Tightening sequence and specification. Refer to ⇒ [Fig. "Cylinder Head, Tightening Sequence and Tightening Specification", page 91](#)

**5 - Cylinder Head**

- ☐ Checking for distortion. Refer to ⇒ [Fig. "Cylinder Head, Checking for Distortion", page 92](#)
- ☐ Removing and installing. Refer to ⇒ [H1.2 ead, Removing and Installing", page 92](#)
- ☐ Compression pressure, checking. Refer to ⇒ [C1.4 hecking", page 112](#)

**6 - Cylinder Head Bolt**

- ☐ Replace after removing
- ☐ With a washer
- ☐ Follow the sequence when loosening. Refer to ⇒ [Fig. "Loosen Cylinder Head", page 91](#)
- ☐ Tightening sequence and specification. Refer to ⇒ [Fig. "Cylinder Head, Tightening Sequence and Tightening Specification", page 91](#)

**7 - O-Ring**

- ☐ Replace after removing
- ☐ Lubricate with engine oil

**8 - Plugs**

- ☐ 5 Nm
- ☐ With ball head for the engine cover

**9 - Cap**

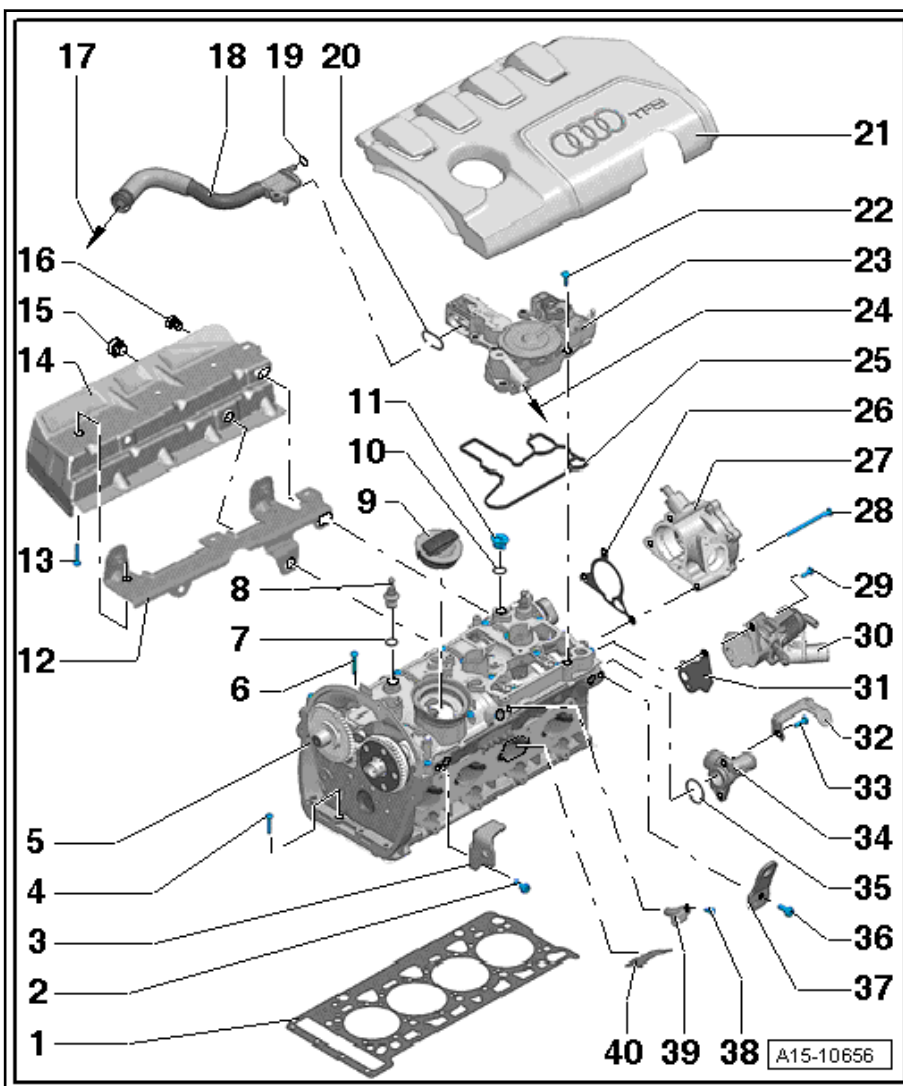
- ☐ With seal

**10 - O-Ring**

- ☐ No replacement part

**11 - Plugs**

- ☐ Replace after removing





- ☐ Coat the O-ring with engine oil

## 12 - Bracket

## 13 - Bolt

- ☐ 9 Nm

## 14 - Heat Shield

## 15 - Bolt

- ☐ 20 Nm

## 16 - Bolt

- ☐ 20 Nm

## 17 - To intake manifold/turbocharger

## 18 - Bleed Pipe

## 19 - O-Ring

- ☐ No replacement part

## 20 - Seal

- ☐ No replacement part

## 21 - Engine Cover

## 22 - Bolt

- ☐ Tightening sequence. Refer to ⇒ [Fig. "Crankcase Ventilation, Tightening Sequence and Tightening Specification", page 91](#) .

## 23 - Crankcase Ventilation

- ☐ Observe sequence for tightening ⇒ [Fig. "Crankcase Ventilation, Tightening Sequence and Tightening Specification", page 91](#)

## 24 - To Intake Manifold

## 25 - Seal

- ☐ No replacement part

## 26 - Seal

- ☐ Replace if damaged

## 27 - Vacuum Pump

- ☐ Removing and installing. Refer to ⇒ [P1.3 ump, Removing and Installing", page 111](#) .

## 28 - Vacuum Pump Bolts

- ☐ M 6 x 70: 9 Nm
- ☐ Replace the bolts

## 29 - Bolt

- ☐ 9 Nm
- ☐ Engine code CBFA only

## 30 - Secondary Air Injection Solenoid Valve -N112-

- ☐ Engine code CBFA only

## 31 - Seal

- ☐ Engine code CBFA only
- ☐ Replace after removing

## 32 - Retaining Plate

## 33 - Bolt

- ☐ 9 Nm

## 34 - Connection

## 35 - O-Ring



- ☐ Replace after removing
- ☐ Coat with coolant

**36 - Bolt**

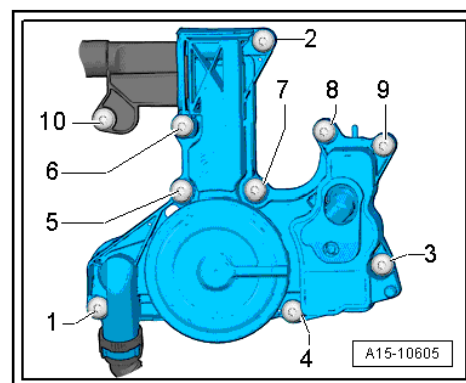
- ☐ 25 Nm

**37 - Transport Strap****38 - Bolt**

- ☐ 9 Nm

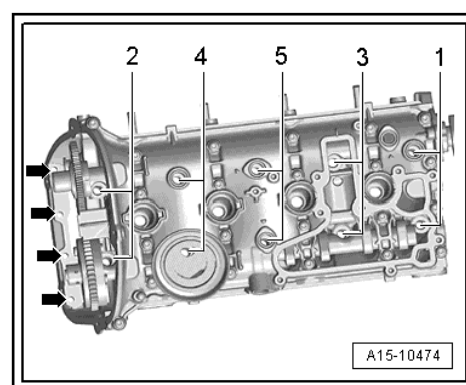
**39 - Camshaft Position Sensor -G40-**

- ☐ With O-ring
- ☐ Lubricate the O-ring with engine oil before installing

**40 - Partition Plate****Crankcase Ventilation, Tightening Sequence and Tightening Specification**

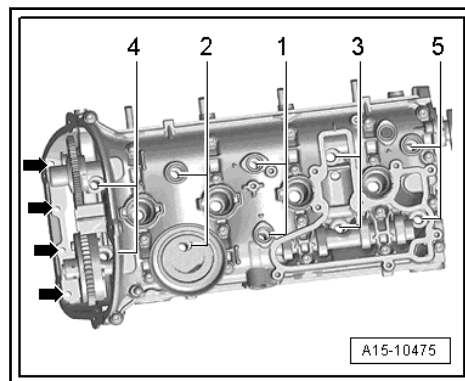
- Tighten the bolts in the steps of the sequence shown:

| Bolts          | Tightening Specification |
|----------------|--------------------------|
| -1 through 10- | 11 Nm                    |

**Loosen Cylinder Head**

- Remove the bolts -arrows-.
- Loosen the cylinder head bolts in the sequence -1 to 5-.

**Cylinder Head, Tightening Sequence and Tightening Specification**



- Tighten the new cylinder head bolts in sequence -1 to 5- and in the stages listed below:

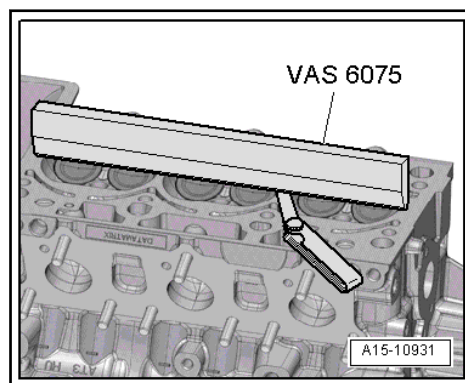
| Step | Bolts         | Tightening Specification/Additional Turn |
|------|---------------|--|
| 1    | -1 through 5- | 40 Nm                                    |
| 2    | -1 through 5- | 90° additional turn                      |
| 3    | -1 through 5- | 90° additional turn                      |
| 4    | -arrows-      | 8 Nm                                     |
| 5    | -arrows-      | 90° additional turn                      |



#### Note

*It is not required to retighten the cylinder head bolts after repairs.*

#### Cylinder Head, Checking for Distortion



- Check the cylinder head at several locations for distortion using a Straight Edge - 500mm -VAS6075- and a feeler gauge.
- Maximum permissible distortion: 0.05 mm

## 1.2 Cylinder Head, Removing and Installing

#### Special tools and workshop equipment required

- ♦ Engine Sling -2024A-
- ♦ Engine Support -T10014-
- ♦ Central Valve Assembly Tool -T10352- (Engine code CCZA: Central Valve Assembly Tool -T10352/1-)



- ◆ Counterhold - Vibration Damper -T10355-
- ◆ Locking Pin (3 pc.) -T40011-
- ◆ Puller - Ignition Coil -T40039-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Torque Wrench 1332 40-200Nm -VAG1332-
- ◆ Shop Crane -VAS6100-
- ◆ Engine Bung Set -VAS6122-
- ◆ Drip Tray for VAG1202A -VAG1306- or Shop Crane - Drip Tray -VAS6208-
- ◆ Polydrive Bit Drive Socket -T10070-
- ◆ Cable Tie

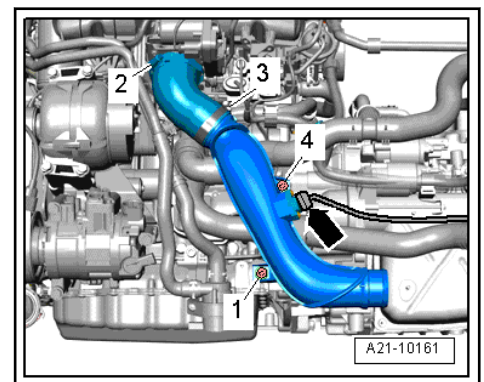
### Removing



#### Note

*All cable ties that are loosened or cut open during removal must be replaced in the same position during installation.*

- Release the pressure in the high pressure reservoir for the fuel system. Refer to [⇒ F1.2 uel Pressure, Reducing", page 299](#) .
- Switch off the ignition and all electric consumers and remove the ignition key.
- Remove the engine cover. Refer to [⇒ C3.1 over, Removing and Installing", page 37](#) .
- Remove the air filter. Refer to [⇒ F3.2 ilter Housing, Removing and Installing", page 312](#) .
- Loosen the hose clamp -2-.



- Remove the bolt -4-.
- Disconnect the connector -arrow- and free up the wire.



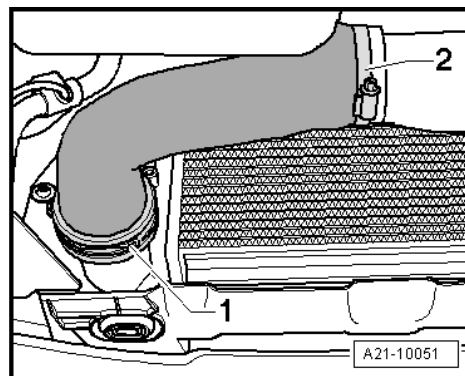
**⚠ WARNING**

The cooling system is under pressure when the engine is warm. Risk of scalding due to hot steam and hot coolant.

Scalding the skin and other parts of the body is possible.

- Wear safety gloves.
- Wear protective eyewear.
- Reduce the pressure by covering the coolant expansion tank cap with a cloth and carefully opening it.

- Open the coolant expansion tank cap.
- Remove the front exhaust pipe with catalytic converter. Refer to ⇒ [E1.2 Exhaust Pipe, Removing and Installing](#), page 357.
- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50; Noise Insulation.
- Remove the right front wheel.
- Remove the right front wheel housing liner. Refer to ⇒ Body Exterior; Rep. Gr. 66; Wheel Housing Liner; Front Wheel Housing Liner, Removing and Installing.
- Disconnect the charge air hose by lifting the clamps -1- and loosening the hose clamp -2-.



- Seal off the connections on the charge air cooler with a clean cloth.
- Place a Drip Tray for VAG1202A -VAG1306- or Shop Crane - Drip Tray -VAS6208- under the engine.

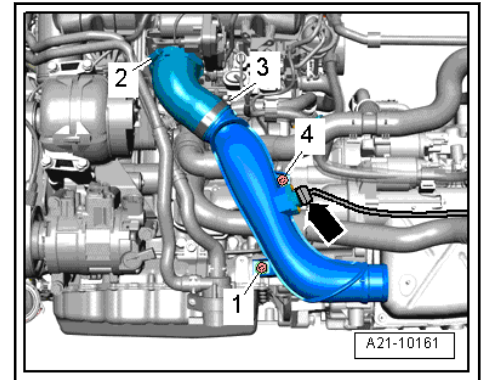


**Note**

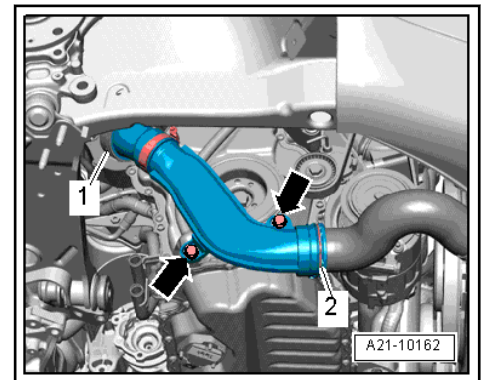
*Drained coolant must be stored in a clean container for disposal or reuse.*

- Drain the coolant. Refer to ⇒ [D1.3 Draining and Filling](#), page 226.
- Remove the bolt -1- and remove the air duct pipe downward.

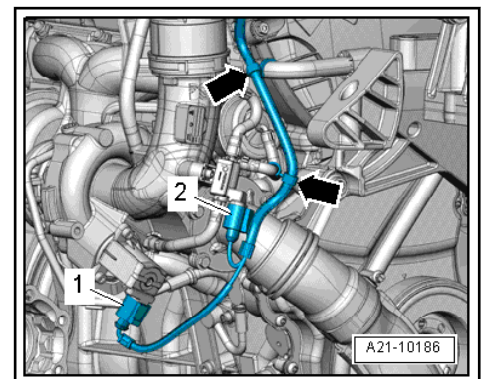




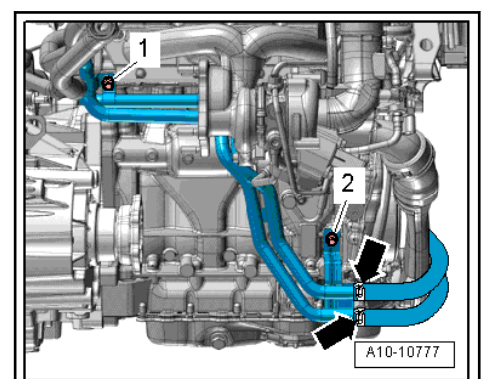
- Remove the bolts -arrows-.



- Remove the air duct pipe by lifting the clamps -1 and 2-.
- Disconnect the connectors -1 and 2- and free up the wire -arrows-.



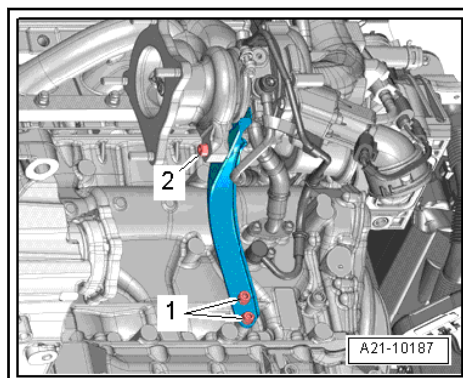
#### Vehicles with Parking Heater



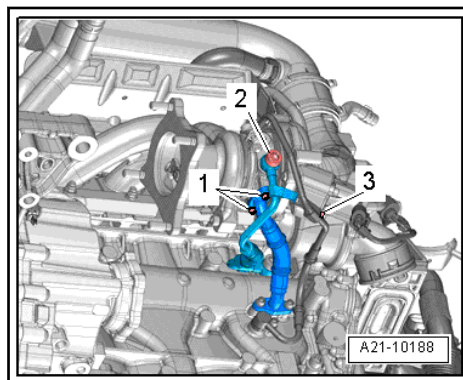


- Remove the bolts -1 and 2- and swivel the coolant pipes to the left.

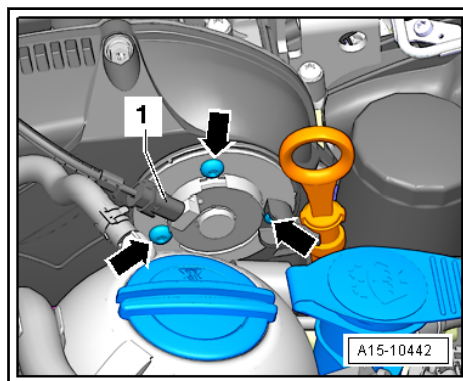
#### Continuation for All Vehicles



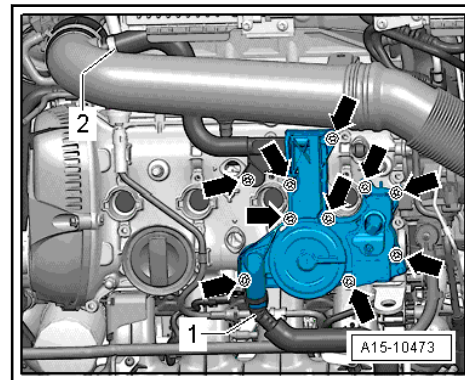
- Remove the bolts -1 and 2- and remove the turbocharger support.
- Remove the banjo bolt -2- and move the coolant line to the side.



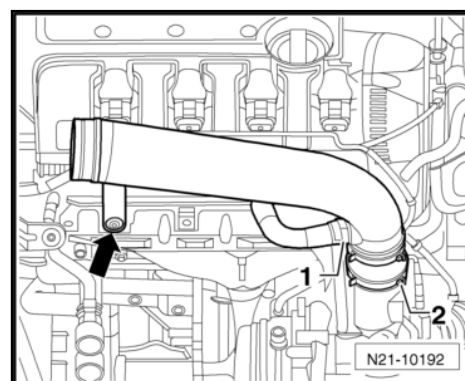
- Remove the bolts -1- on the oil return line.
- Remove the bolt -3- on the oil supply line.
- If equipped, remove the charge air guide to the sound generator.
- Disconnect the connector from the Camshaft Adjustment Valve 1 -N205- -1-.



- Remove the Ignition Coils with Power Output Stages (refer to [C1.3 oils with Power Output Stages, Removing and Installing](#), page 371 ) and free up the wiring harness.
- Disconnect the crankcase ventilation hose -1-.



- Remove the bolts -arrows-.
- Remove the air duct pipe bolt -arrow-.



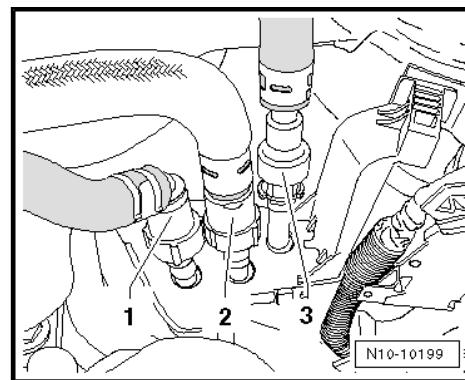
- Loosen the hose clamp -2- and remove the air duct pipe together with the crankcase ventilation.

#### Continuation for All Engine Codes

#### WARNING

The fuel system is under pressure.  
Risk of injury from fuel spraying out.

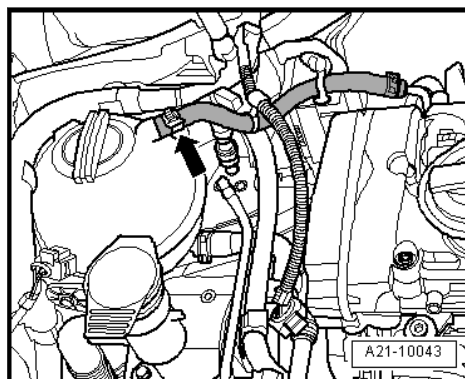
- Wear protective eyewear.
  - Wear safety gloves.
  - Reduce the pressure: Place clean cloths around the connection point and carefully open the connection point.
- Disconnect the lines at the connection point. Collect leaking fuel with a cleaning cloth.



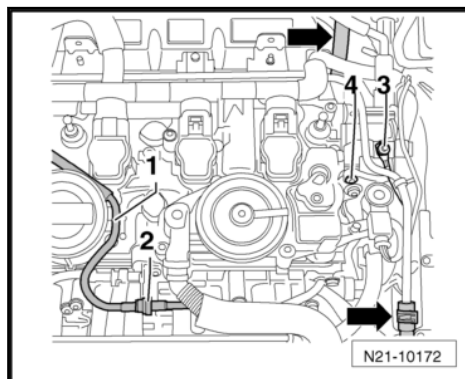
- 1 - Bleeder line (press the circlip to release the line).



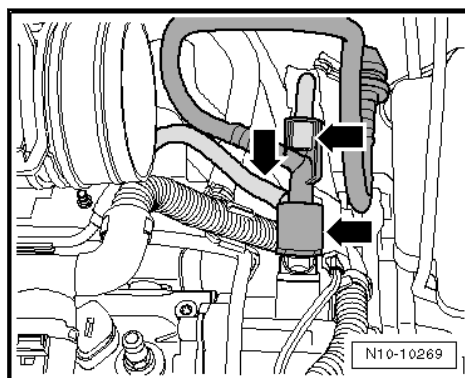
- 2 - Vacuum line (press the circlip to release the line), if equipped.
- 3 - Fuel supply line (pull the circlip upward to release the line).
- Disconnect the coolant hose leading to the coolant expansion tank -arrow-.



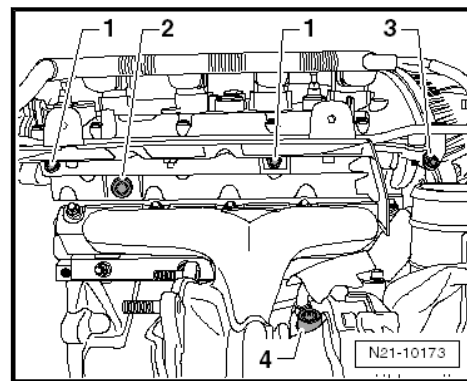
- Remove the coolant hoses -arrows- from the coolant pipe.



- Disconnect the ground wire -3- and remove the bolt -4-.
- Disconnect the vacuum hoses -arrows-.



- Remove the bolts -1 through 3- and remove the heat shield together with the coolant pipe.

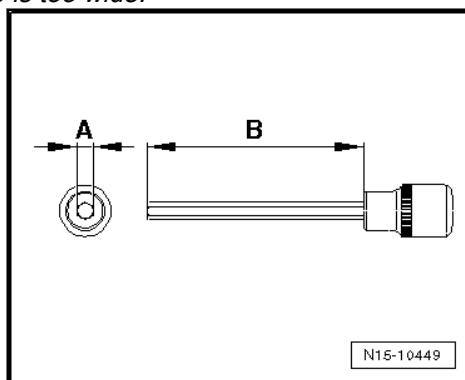


Remove the bolt -2- from the heat shield using a 6 mm wrench.

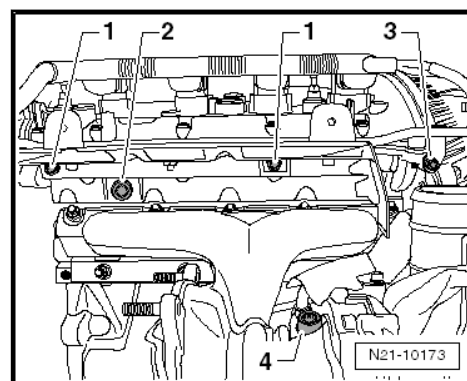


#### Note

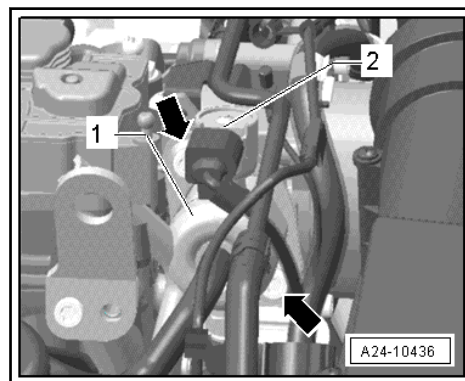
*The hex socket must be at least 5 cm long -B-. A socket -A- that tapers to 6 mm at the tip is too wide.*



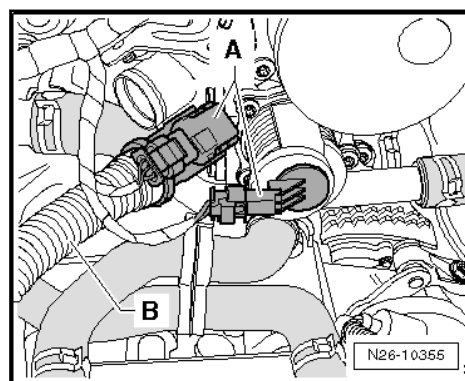
- Disconnect the oil supply line from the turbocharger -4-.



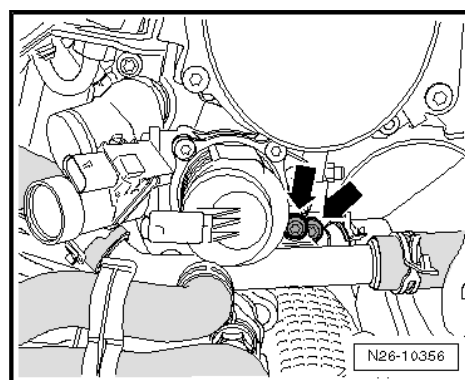
- Disconnect the connector -2- from the Fuel Pressure Regulator Valve -N276-.



### Engine Code CBFA

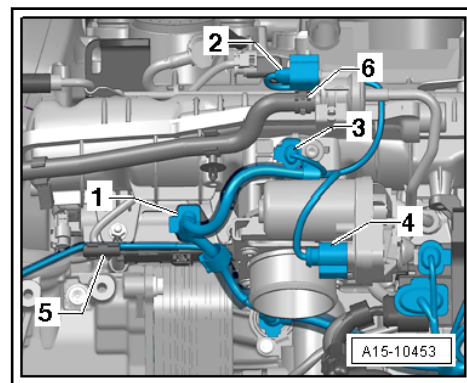


- Disconnect the connector -A- and hose -B- from the Secondary Air Injection Solenoid Valve -N112-.
- Loosen the coolant pipe by removing the bolts -arrows-.

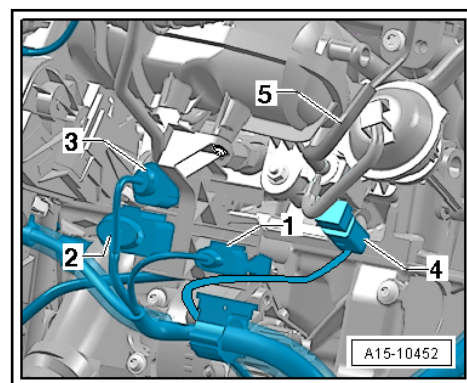


### Continuation for All Engine Codes

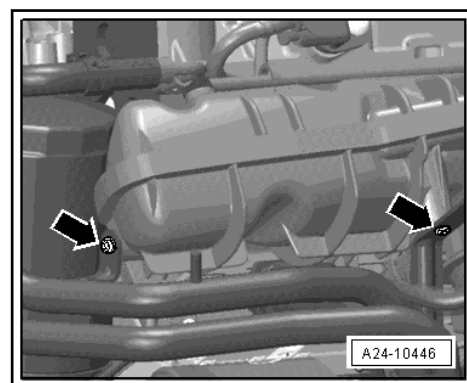
- Disconnect the coolant hose from the side connection on the cylinder head.
- Disconnect the connectors -1 through 4-.



- Free up the wire -5-.
- Disconnect the EVAP canister vacuum hose -6-.
- Disconnect the connector -1- and pull the connectors out of the retainer.

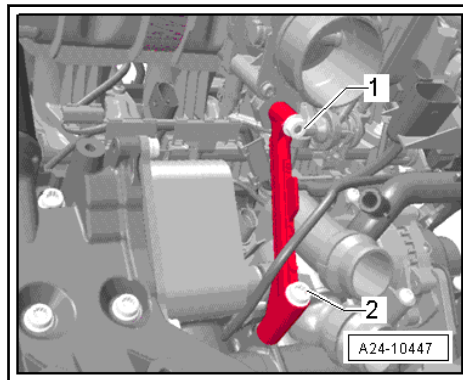


- Disconnect the connectors -2 through 4-.
- Disconnect the coolant line from the intake manifold by the removing the bolts -arrows-.

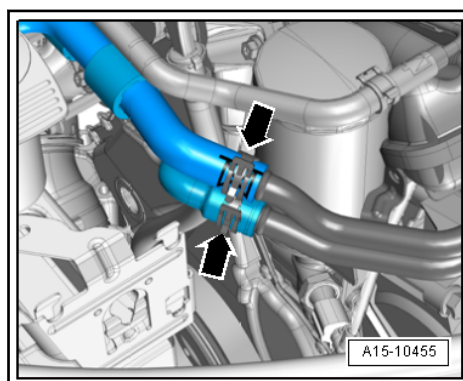


- Remove the intake manifold support by removing the nut -1- and bolt -2-.

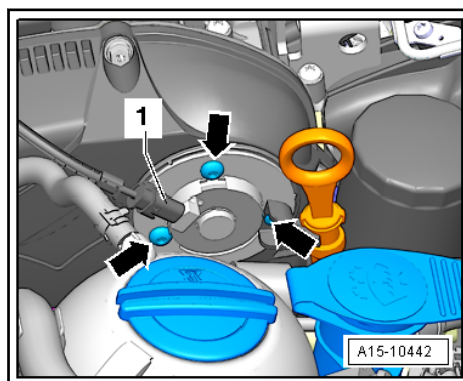




- Remove the oil filter. Refer to ➤ [-3.1 Oil Filter Housing / Oil Pressure Switch F1](#)”, page 206 .
- Disconnect the coolant hoses -arrows- and free them up.



- Remove the bolts -arrows- and then remove the Camshaft Adjustment Valve 1 -N205-.



- Remove the upper timing chain cover. Refer to ➤ [T2.2 Timing Chain Cover, Removing and Installing](#)”, page 117 .

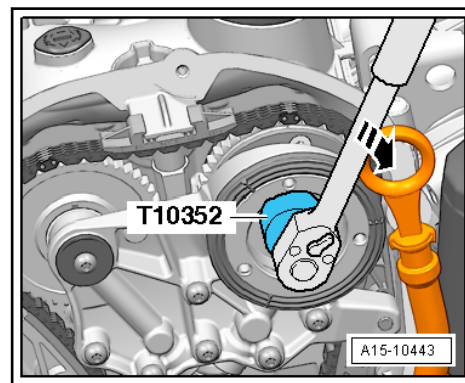


**Note**

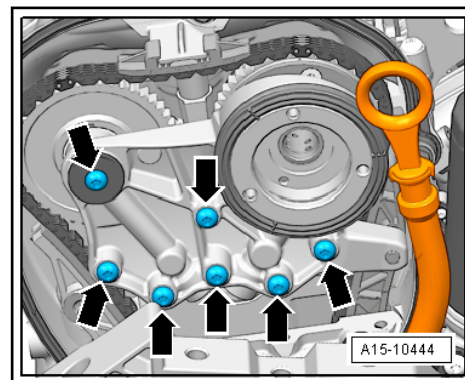
*The control valve has left-hand thread.*

- Remove the control valve in the direction of -arrow- using the Central Valve Assembly Tool -T10352-.

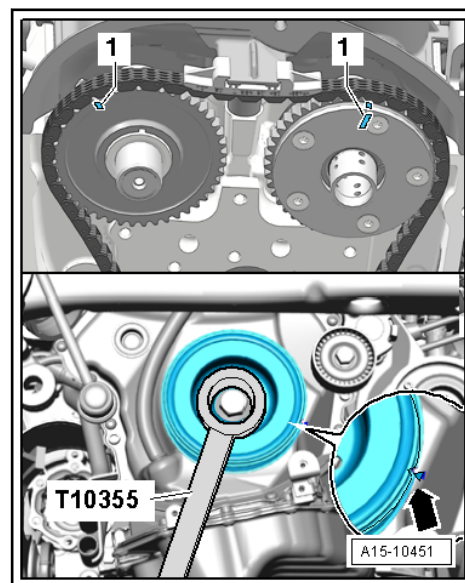




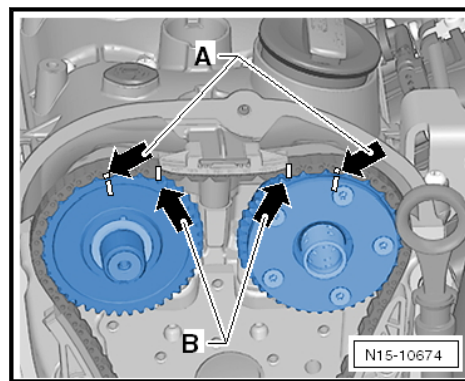
- Remove the bolts -arrows- and remove the bearing bracket.



- Turn the vibration damper into “TDC” -arrow- using the Counterhold - Vibration Damper -T10355A-.

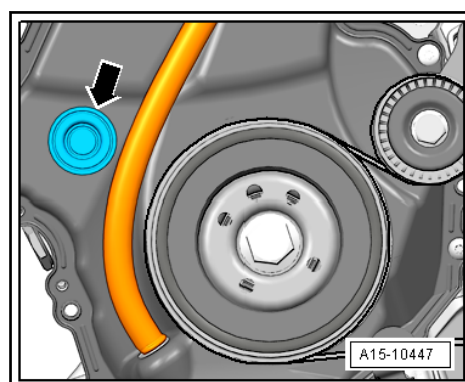


- The notch on the vibration damper must align with the arrow marking on the lower timing chain cover.
- The markings -1- on the camshafts must point upward.
- Carefully mark the position of the drive chain to the chain sprockets -A arrows- with a waterproof marker. Also mark the position of the drive chain to the guide rail -B arrows-.



These marks are necessary for reinstallation.

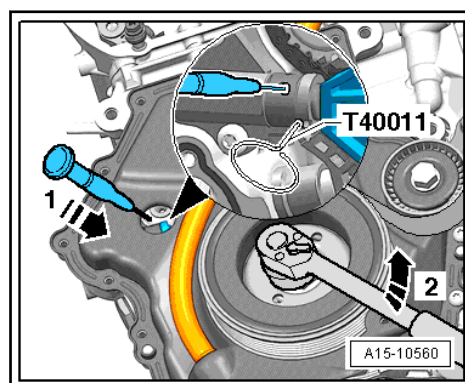
- Remove the plug -arrow-.



The locking wedge in the chain tensioner must be lifted in order to release the tension from the chain tensioner. Sand the end of the Locking Pin (3 pc.) -T40011- down to a point. A screwdriver with a blade width of approximately 1.5 mm can also be used.

There is a risk of damaging the chain tensioner.

- Raise the locking wedge in the chain tensioner. Insert the screwdriver in the chain tensioner bore in direction of arrow -1-.



- In order to tension the chain tensioner, turn the crankshaft opposite the direction of engine rotation -2-. Secure the chain tensioner using the Locking Pin (3 pc.) -T40011-.

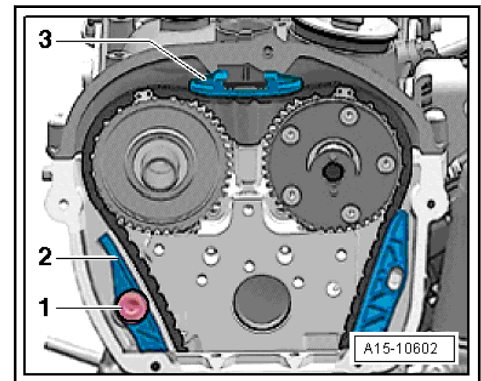


**Note**

*The intake camshaft switches in the engine direction of rotation.*



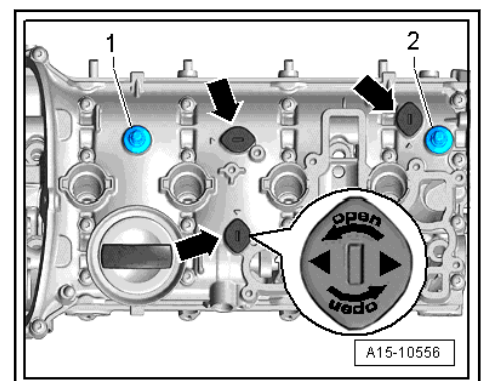
- Remove the bolt -1- and guide the tensioning rail -2- downward.



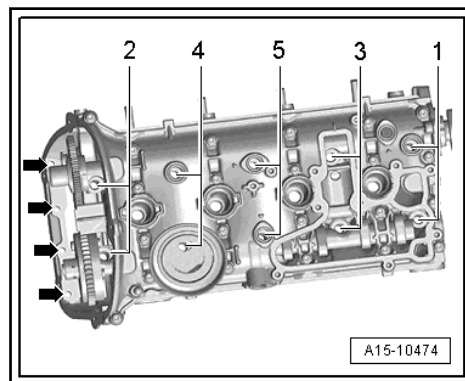
- Remove the upper guide rail -3- by unlocking the latch (located in the center) with a screwdriver and pushing the guide rail forward.
- Remove camshaft timing chain from chain sprockets.

### **i** Note

- ◆ *Risk of damaging the valves, piston crowns and lower timing chain cover.*
- ◆ *If the camshaft timing chain was removed from the cylinder head, then the crankshaft may not be turned farther.*
- ◆ *Panels are installed on the lower timing chain cover to prevent the chain from falling down. If the crankshaft is rotated on a loose chain, the panels can bend.*
- Turn the sealing plug -arrows- counterclockwise 90° in the direction of -arrow- and remove it.



- Remove the ball head -1 and 2-.
- Remove the cap.
- Remove the bolts -arrows-.

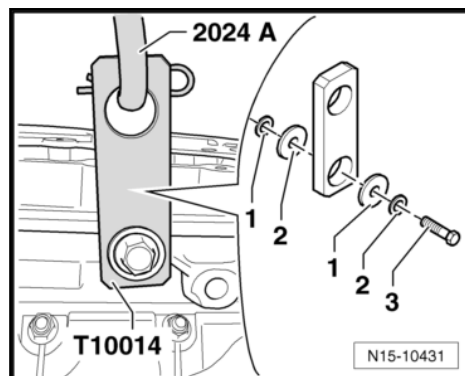


- Remove the cylinder head bolts in sequence -1 through 5- using Polydrive Bit Drive Socket -T10070- until 2 are left.

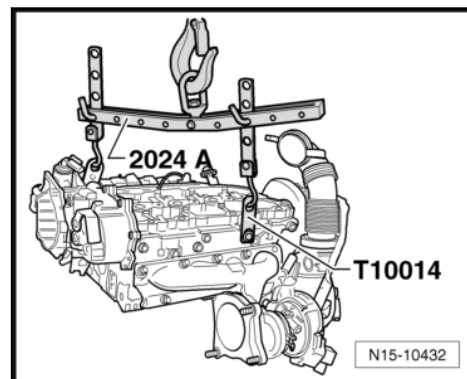


#### Note

- ◆ *To remove the cylinder head bolts, the camshaft must be turned using, if necessary, a wrench.*
  - ◆ *Make sure all necessary wires are loosened!*
  - ◆ *Pay attention to the tension and guide tracks when lifting the cylinder head.*
- Attach the Engine Support -T10014- with the corresponding small and large washers as shown.



- 1 - M8 washer, small
  - 2 - M8 washer, large. The outer diameter of the washer must be larger than the hole in the bracket.
  - 3 - M 8 x 30 Bolt
- Engage the Engine Sling -2024A- into the Engine Support -T10014- and into the left front lifting eye on the cylinder head.
  - Engage the Engine Sling -2024A- into the Shop Crane - Drip Tray -VAS6208-. Then lift up the cylinder head completely.



- Remove both of the last cylinder head bolts.
- Carefully lift the cylinder head upward until the camshaft timing chain glide rail is free.

The tension- and guide rail must not be damaged.

- Lay the cylinder head on a soft surface, such as foam.

### Installing



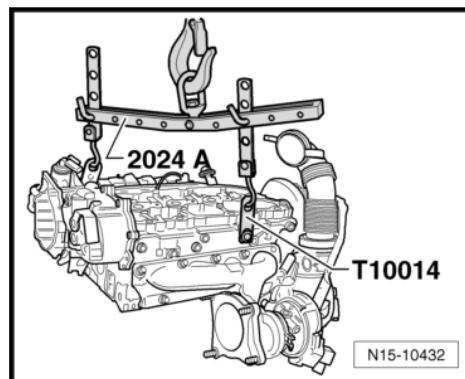
#### Note

- ◆ *There is a risk of damaging the sealing surfaces.*
- ◆ *Carefully remove the sealant residue from the cylinder head and cylinder block.*
- ◆ *Make sure that no long grooves or scratches result.*
- ◆ *Risk of damaging the cylinder block.*
- ◆ *There must be no oil or coolant in the blind holes for the cylinder head bolts in the cylinder block.*
- ◆ *Risk of the cylinder head gasket leaking.*
- ◆ *Carefully remove all grinding and sanding residue.*
- ◆ *Only unpack the new cylinder head gasket immediately before installing.*
- ◆ *To prevent the cylinder head gasket silicone layer and recessed area from being damaged, always handle the gasket extremely carefully.*



#### Note

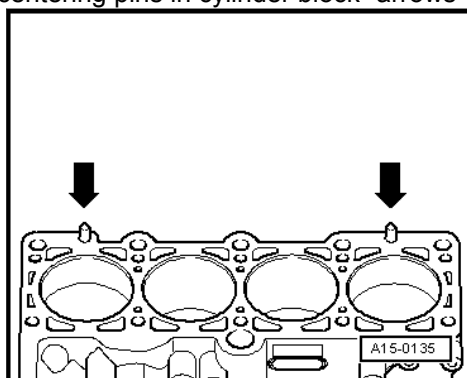
- ◆ *Replace the bolts that were tightened with an additional turn.*
- ◆ *Replace self-locking nuts, sealing rings, seals and O-rings.*
- ◆ *If a replacement cylinder head is being installed, the contact surfaces between the hydraulic lifters, the roller rocker levers and the cam running surfaces must be oiled before the camshaft housing is installed.*
- ◆ *Secure all hose connections with hose clamps that match the ones used in series production. Refer to the Parts Catalog.*
- ◆ *Do not reuse coolant that has been drained.*
- Engage the cylinder head on the Shop Crane - Drip Tray -VAS6208- and position above the cylinder block.



- Carefully lower the cylinder head.

The tension- and guide rail must not be damaged.

- ♦ Pay attention to centering pins in cylinder block -arrows-.



- ♦ Pay attention to the cylinder head gasket installation position: the part number must be readable from the intake side.

When rotating the crankshaft, make sure the timing chain cannot damage any other components.

- If the crankshaft was turned in the meantime: bring the piston for cylinder 1 to TDC and then turn the crankshaft back again slightly.
- Position the cylinder head.
- Insert cylinder head bolts and tighten by hand. Refer to [Fig. “Cylinder Head, Tightening Sequence and Tightening Specification”, page 91](#).



#### Note

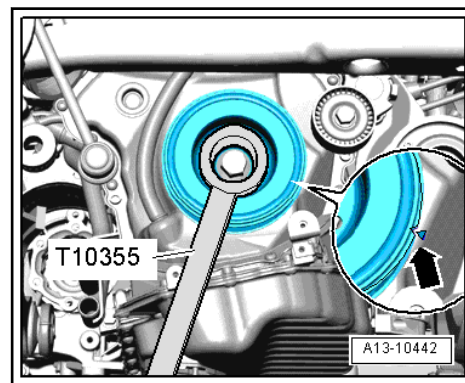
*To install the cylinder head bolts, the intake camshaft must be turned with a wrench.*



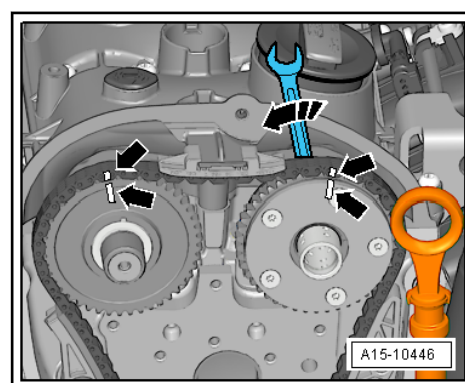
#### Note

*It is not required to retighten the cylinder head bolts after repairs.*

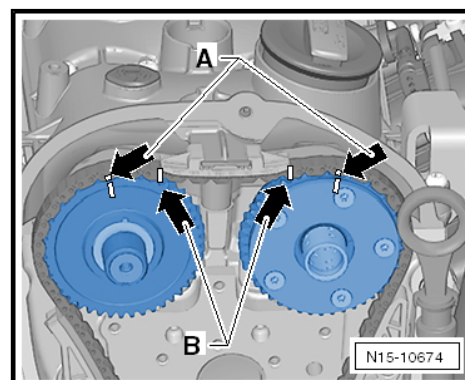
- Turn the vibration damper into “TDC” -arrow- using the Counterhold - Vibration Damper -T10355A-.



- The notch on the vibration damper must align with the arrow marking on the lower timing chain cover.
- Mount the timing chain on the intake camshaft.

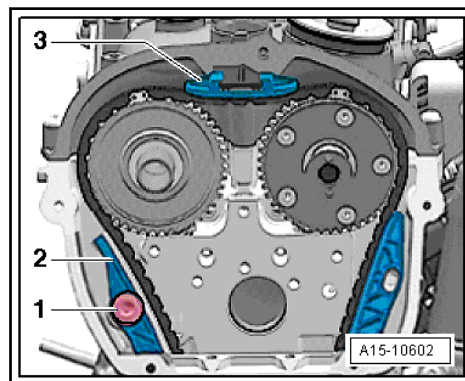


- The markings must align.
- Turn the intake camshaft in direction of -arrow- with a wrench until the timing chain is »taut«. »Hold« the intake camshaft secure in this position.
- Mount the timing chain on the exhaust camshaft.



- The markings on the drive chain and chain sprocket -A arrows- and the drive chain and guide rail -B arrows- must line up with each other.
- Install the upper glide rail -3-.



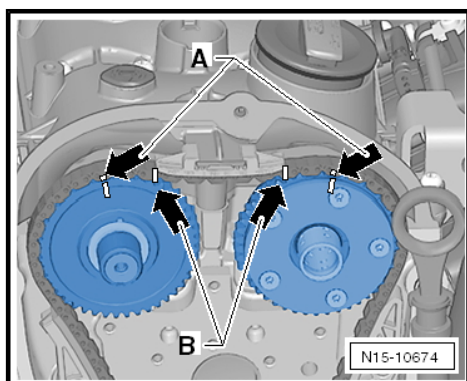


- Move the tensioning rail -2- up and tighten the bolt -1-.



#### Note

*If the markings on the drive chain and glide rail -B arrows- do not align even though the engine is at »TDC«, the drive chain has skipped on the crankshaft chain sprocket. Valve timing, checking. Refer to ⇒ [T3.7 Timing, Checking](#), page 155 . If the timing does not agree, the camshaft timing chain must be positioned »again«. Refer to ⇒ [T3.3 Timing Chain, Removing and Installing](#), page 130 .*



Install in reverse order of removal. Note the following:

- Fill with engine oil. Refer to ⇒ Maintenance; Booklet 20.1.
- Check the oil level. Refer to ⇒ [O1.2 il](#), page 193 .
- Replace coolant. Refer to ⇒ [D1.3 draining and Filling](#), page 226 .
- Check the Engine Control Module DTC memory and erase, if necessary, any entries that occurred during assembly. Refer to Vehicle Diagnostic Tester "Guided Function".



#### Note

*If the DTC memory was erased, the readiness code must be regenerated using the Vehicle Diagnostic Tester in "Guided Functions".*

#### Tightening Specification

- ◆ Refer to ⇒ [-1.1 Cylinder Head](#), page 88
- ◆ Refer to ⇒ [-2.2 Charge Air System](#), page 283
- ◆ Refer to ⇒ [-3.1 Coolant Pipes](#), page 249





- ◆ Refer to ⇒ [-3.1 Air Filter Housing”, page 310](#)

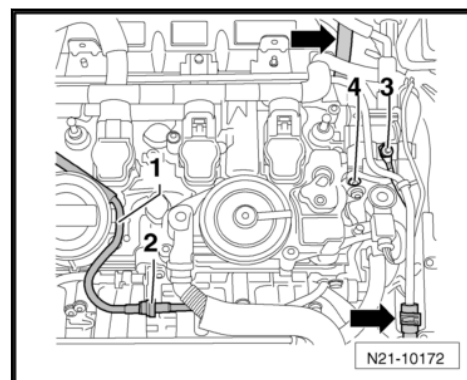
## 1.3 Vacuum Pump, Removing and Installing

Special tools and workshop equipment required

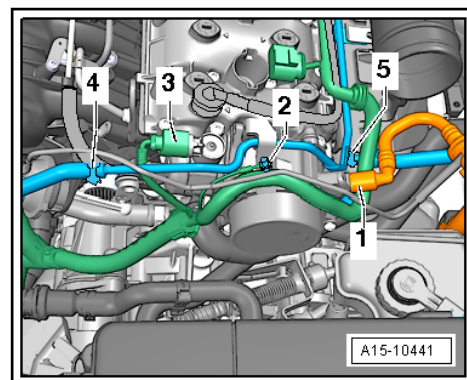
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-

### Removing

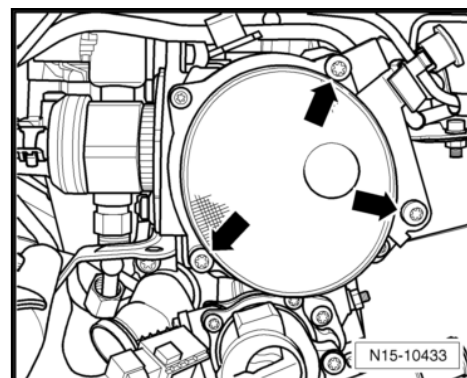
- Remove the engine cover. Refer to ⇒ [C3.1 over, Removing and Installing”, page 37](#) .
- Remove the air filter. Refer to ⇒ [F3.2 ilter Housing, Removing and Installing”, page 312](#) .
- Remove the high pressure pump with the »roller tappet«. Refer to ⇒ [P7.3 ressure Pump, Removing and Installing”, page 347](#) .
- Disconnect the ground wire -3- and remove the bolt -4-.



- Remove the vacuum hose -1- from the vacuum pump.



- Remove the bolts -arrows- and remove the vacuum pump.





**Note**

*Do not disassemble the vacuum pump.*

**Installing**

- Clean the sealing surfaces.
- Install the seal on the vacuum pump, install the two bolts and then mount it on the cylinder head.

The rest of the assembly is performed in the reverse order of removal.

**Tightening Specification**

- ◆ Refer to [⇒ -1.1 Cylinder Head", page 88](#)
- ◆ Refer to [⇒ -7.1 High Pressure Pump", page 343](#)
- ◆ Refer to [⇒ -3.1 Air Filter Housing", page 310](#)

## 1.4 Compression, Checking

**Special tools and workshop equipment required**

- ◆ Spark Plug Removal Tool -3122B-
- ◆ Puller - Ignition Coil -T40039-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Compression Tester Kit -VAG1763- with Compression Tester Kit - Adapter 6 -VAG1763/6-

**Test Conditions**

- Engine oil temperature must be at least 30 °C (86 °F).
- Battery voltage at least 12.7 V

**Test Sequence**



**Note**

*Follow all safety precautions. Refer to [⇒ P1 recautions", page 1](#).*

- Remove the Ignition Coils with Power Output Stages. Refer to [⇒ C1.3 oils with Power Output Stages, Removing and Installing", page 371](#).
- Remove the Spark Plugs with the Spark Plug Removal Tool -3122B-.
- Check the compression pressure using the Compression Tester Kit -VAG1763- and Compression Tester Kit - Adapter 6 -VAG1763/6-.



**Note**

*Refer to the Operating Instructions for information on using the tester.*

- Operate the starter until no further pressure increases are indicated by the Tester.



### Compression Values

- New: 11 to 14 bar (160 to 203 psi) pressure
- Wear limit: 7 bar (101.52 psi) pressure
- Permissible difference between all cylinders: maximum 3 bar (43 psi)
- Install the Spark Plugs. Refer to [⇒ -1.1 Ignition System", page 368](#) .
- Install the Ignition Coils with Power Output Stages. Refer to [⇒ C1.3 oils with Power Output Stages, Removing and Installing", page 371](#) .



#### Note

*By separating the connections, DTCs will be stored. After the test, check the DTC memory and erase, if necessary.*

- Check the Engine Control Module DTC memory and erase, if necessary, any entries that occurred during assembly. Refer to Vehicle Diagnostic Tester "Guided Function".



#### Note

*If the DTC memory was erased, the readiness code must be regenerated using the Vehicle Diagnostic Tester in "Guided Functions".*



## 2 Timing Chain Cover

⇒ [-2.1 Timing Chain Cover", page 114](#)

⇒ [T2.2 iming Chain Cover, Removing and Installing", page 117](#)

⇒ [T2.3 iming Chain Cover, Removing and Installing", page 118](#)

### 2.1 Overview - Timing Chain Cover

**1 - O-Ring**

- ☐ Replace after removing
- ☐ Coat with oil before assembly

**2 - Oil Dipstick Tube****3 - Bolt**

- ☐ 9 Nm

**4 - Bolt**

- ☐ 9 Nm

**5 - Camshaft Adjustment Valve 1 -N205-**

- ☐ Removing and installing. Refer to ⇒ [C4.4 Camshaft Adjustment Valve 1 N205, Removing and Installing](#), page 169 .

**6 - Seal**

- ☐ Replace if damaged
- ☐ Coat with oil before assembly

**7 - Bolt**

- ☐ Tightening sequence and specification. Refer to ⇒ [Fig. "Upper Timing Chain Cover - Tightening Sequence and Tightening Specification"](#), page 116 .

**8 - Upper Timing Chain Cover**

- ☐ Removing and installing. Refer to ⇒ [T2.2 Timing Chain Cover, Removing and Installing](#), page 117 .
- ☐ Tightening sequence. Refer to ⇒ [Fig. "Upper Timing Chain Cover - Tightening Sequence and Tightening Specification"](#), page 116 .

**9 - Seal**

- ☐ Replace if damaged

**10 - O-Ring**

- ☐ Replace after removing
- ☐ Coat with oil before assembly

**11 - Alignment Pins**

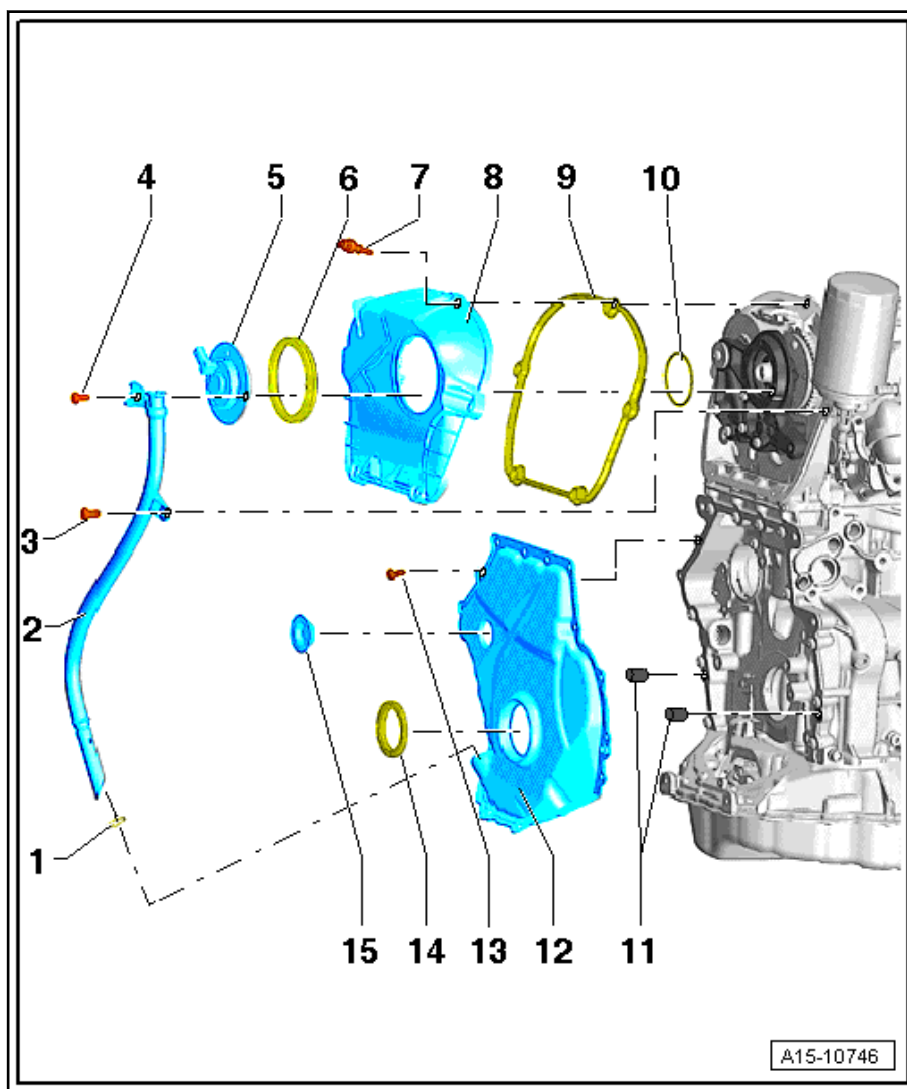
- ☐ Centering the cover

**12 - Lower Timing Chain Cover**

- ☐ Removing and installing. Refer to ⇒ [T2.3 Timing Chain Cover, Removing and Installing](#), page 118 .
- ☐ After removing and installing, check for deformation and replace if necessary.

**13 - Bolt**

- ☐ Replace after removing
- ☐ Tightening sequence and specification. Refer to ⇒ [Fig. "Lower Timing Chain Cover - Tightening Specifications and Tightening Sequence"](#), page 116 .

**14 - Seal**

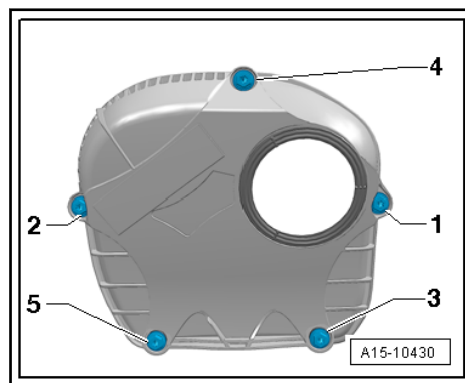


- ☐ For the vibration damper
- ☐ Replacing. Refer to ➔ [D1.5 amper Seal, Replacing](#), page 51 .

### 15 - Plugs

- ☐ Replace after removing

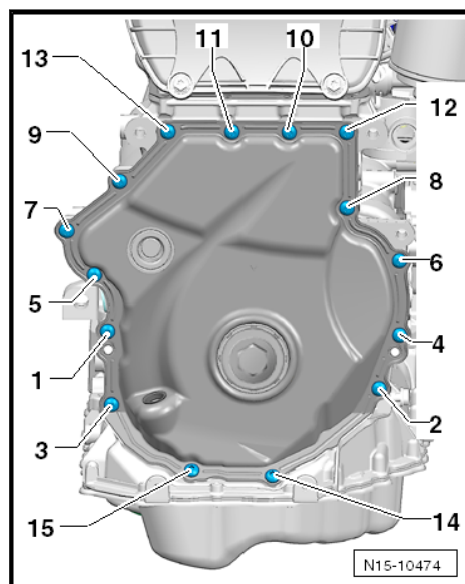
### Upper Timing Chain Cover - Tightening Sequence and Tightening Specification



- Tighten bolts in stages and in sequence -1 to 5- as follows:

| Step | Bolts    | Tightening Specification |
|------|----------|--------------------------|
| 1    | -1 to 5- | Tighten hand-tight       |
| 2    | -1 to 5- | 9 Nm                     |

### Lower Timing Chain Cover - Tightening Specifications and Tightening Sequence



- Tighten the new bolts in steps in the sequence -1 through 15- as follows:

| Step | Bolts     | Tightening Specification/Additional Turn |
|------|-----------|--|
| 1    | -1 to 15- | Tighten hand-tight                       |
| 2    | -1 to 15- | 8 Nm                                     |
| 3    | -1 to 15- | 45° additional turn                      |



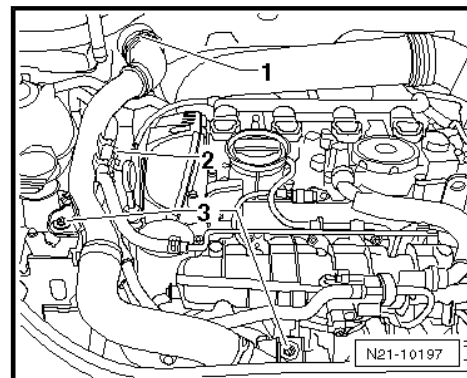
## 2.2 Upper Timing Chain Cover, Removing and Installing

### Special tools and workshop equipment required

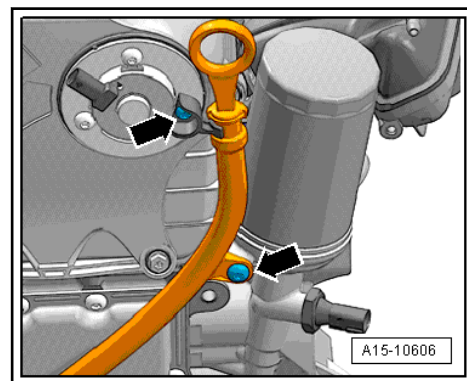
- ◆ Torque Wrench 1783 - 2-10Nm -VAG1783-
- ◆ Torque Wrench 1783 - Open Jaw - 10mm -VAG1783/1-

### Removing

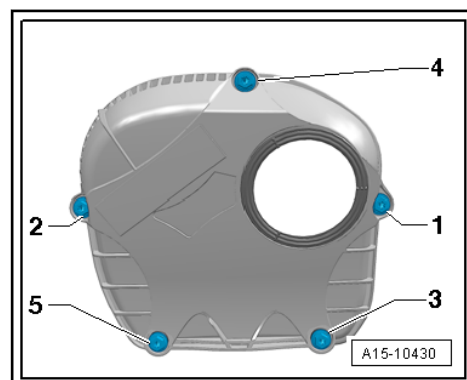
- Vehicles with sound generator: open the locking mechanism -1-, unclip the fuel lines -2- and loosen the bolt -3- on the EVAP canister. Move the charge air pipe aside.



- Press the coolant hoses to the side and secure them with a cable tie.
- Remove the bolts -arrows- and remove the oil dipstick tube from the timing chain cover.



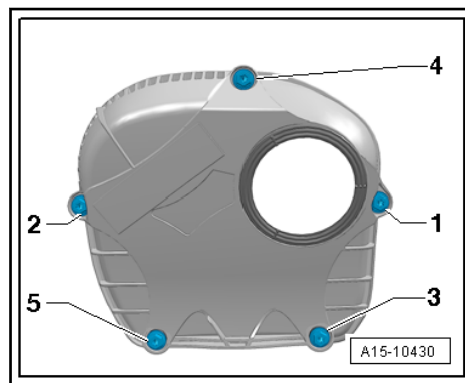
- Remove the Camshaft Adjustment Valve 1 -N205-.
- Remove the bolts -1 through 5- and remove the upper timing chain cover.





## Installing

- Coat the seal and the O-ring with engine oil.
- Tighten the bolts -1 through 5-. Refer to ➔ [Fig. ""Upper Timing Chain Cover - Tightening Sequence and Tightening Specification""](#), page 116 .



Further assembly is performed in the reverse order of the removal.

## Tightening Specification

- ◆ Refer to ➔ [-2.1 Timing Chain Cover", page 114](#)

## 2.3 Lower Timing Chain Cover, Removing and Installing

### Special tools and workshop equipment required

- ◆ Counterhold - Vibration Damper -T10355-
- ◆ Press Piece - Timing Chain Cover -T10368-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Torque Wrench 1332 40-200Nm -VAG1332-
- ◆ Engine Support Bridge -10-222A-
- ◆ Engine Support Bridge - Spindle -10-222A/11-
- ◆ Engine Support Bridge - Engine Support 28 -10-222A/28-
- ◆ Engine Support Bridge - Engine Support 31 -10-222A/31-
- ◆ Engine Support - Basic Set - Rail with Holes -T40091/2- from the Engine Support - Basic Set -T40091-
- ◆ Engine Support - Supplement Kit - Mount -T40093/5- from the Engine Support - Supplement Kit -T40093A-
- ◆ Engine Support Bridge - Engine Support 28-2 -10-222A/28-2-, quantity: 2
- ◆ Engine Support - Basic Set - Square Pipe -T40091/1- (quantity: 2) from the Engine Support - Basic Set -T40091-
- ◆ Engine Support - Basic Set - Movable Joint -T40091/3- (quantity: 2) from the Engine Support - Basic Set -T40091-
- ◆ Engine Support - Movable Joint -T40093/4- (quantity: 2) from the Engine Support - Supplement Kit -T40093A-
- ◆ Bits for VAG1331/13 -T10099-
- ◆ Silicone Sealant
- ◆ Flat-Blade Scraper
- ◆ Hand drill with plastic brush attachment- adaptation



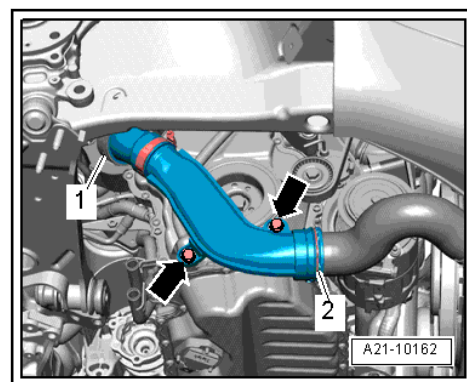


◆ Protective Eyewear

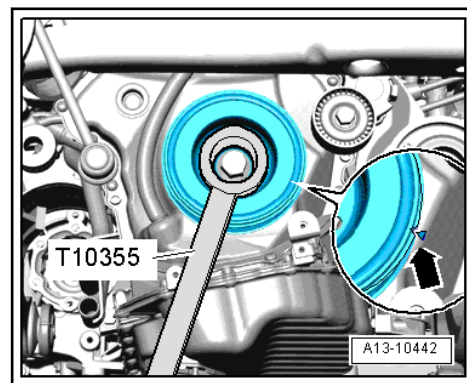
◆ Feeler Gauge

### Removing

- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50; Noise Insulation.
- Remove the right front wheel.
- Remove the right front wheel housing liner. Refer to ⇒ Body Exterior; Rep. Gr. 66; Wheel Housing Liner; Overview - Front Wheel Housing Liner.
- Drain the engine oil. Refer to ⇒ Maintenance; Booklet 20.1.



- Remove the bolts -arrows-.
- Remove the air duct pipe by lifting the clamps -1 and 2-.
- Remove the ribbed belt. Refer to ⇒ [B1.2 elt, Removing and Installing](#), page 45.
- Turn the vibration damper into "TDC" -arrow- using the Counterhold - Vibration Damper -T10355A-.



- The notch on the vibration damper must align with the arrow marking on the lower timing chain cover.



### Note

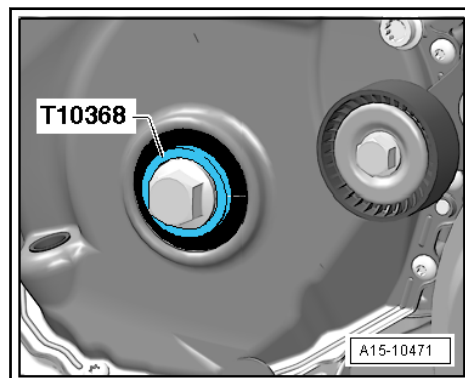
*In order not to change the valve timing, the crankshaft must not be moved out of the "TDC" position when the vibration damper bolt is removed.*

- Remove vibration damper bolt using the Counterhold - Vibration Damper -T10355A-.
- Remove the vibration damper.

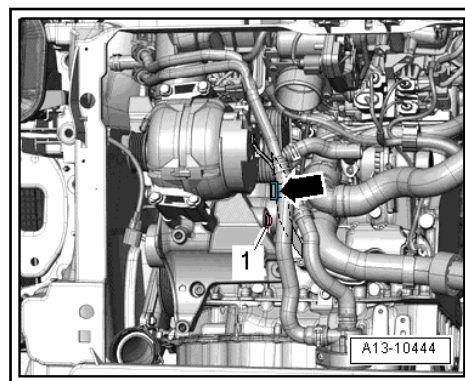


To avoid damaging the splines, only install the vibration damper bolt with the Press Piece - Timing Chain Cover -T10368-.

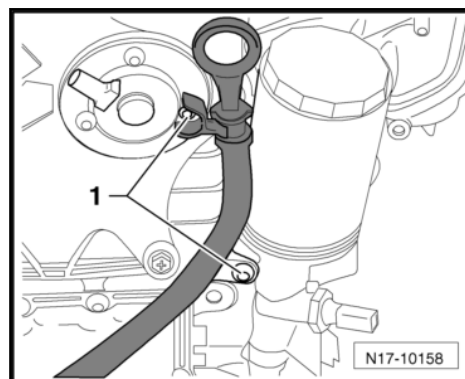
- Reinstall the vibration damper bolt and Press Piece - Timing Chain Cover -T10368-.



- Support the engine in its installed position and remove the engine mount. Refer to [⇒ M2.2 ount, Removing and Installing”, page 24](#) .
- Lift the engine approximately 50 mm and loosen the upper bolt for the engine support.
- Now lower the engine approximately 100 mm.
- Free up the wiring harness -arrow-.

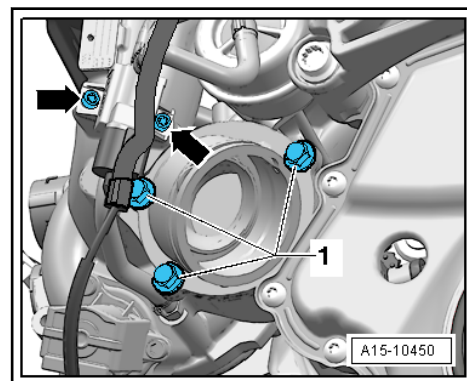


- Remove the bolt -1- and remove the ribbed belt tensioner from the accessory assembly bracket.
- Remove the lower engine support bolts using the Bits for VAG1331/13 -T10099-.
- Remove the engine support and the bolts.
- Remove the bolts -1-. Then pull the oil dipstick tube out of the lower timing chain cover.

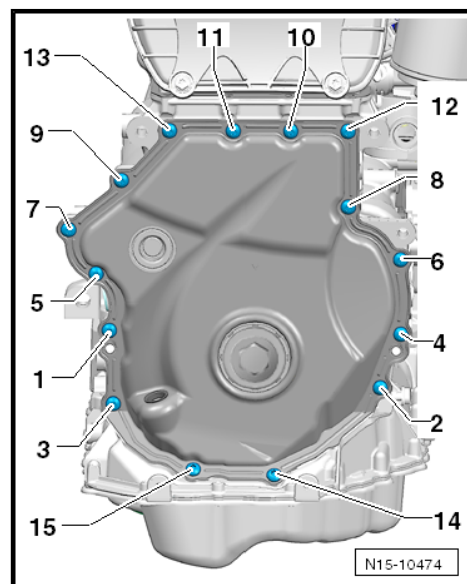




- Disconnect the Wastegate Bypass Regulator Valve -N75- from the turbocharger -arrows-.

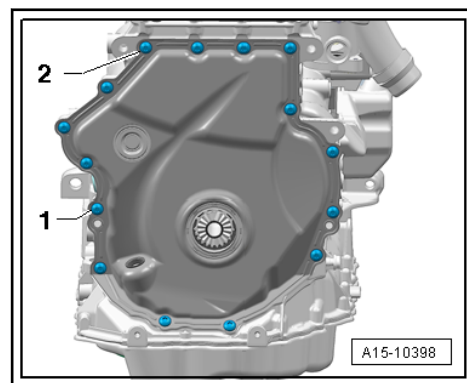


- Remove the turbocharger support -1-.
- Remove the bolts -1 through 15-.



There is a risk of damaging the lower timing chain cover. To avoid deformation, do not hold between the bolting points.

- Pry off the lower timing chain cover; when doing this, begin at -1 and 2-.





## Installing



### Note

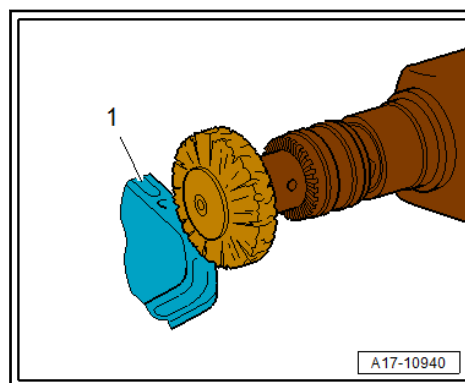
- ◆ *Sealing surfaces must be completely free of oil and grease.*
- ◆ *Check the expiration date of the Silicone Sealant.*
- ◆ *The cover must be installed within 5 minutes after applying Silicone Sealant.*
- ◆ *Replace the bolts that were tightened with an additional turn.*
- ◆ *Replace the gaskets, seals and self-locking nuts.*
- Remove any sealant residue on the cylinder block using a flat blade scraper.



### WARNING

**Risk of injuring the eyes from sealant residue.**

- **Wear protective eyewear.**
- Seal off both sides of the sealing ring with tape to prevent soiling.
- Use a rotating plastic brush to remove any sealant residue from the cover.

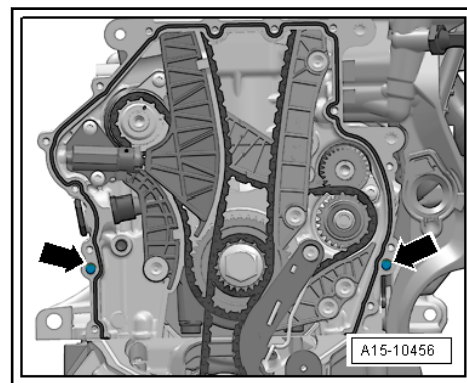


- Sealing surfaces must be free of oil and grease.
- Install the cover with the old bolts and tighten. Refer to ➤ [Fig. "Lower Timing Chain Cover - Tightening Specifications and Tightening Sequence", page 116](#).
- Check the distance between the cover and housing using a feeler gauge.
- The distance must not exceed 0.2 mm.

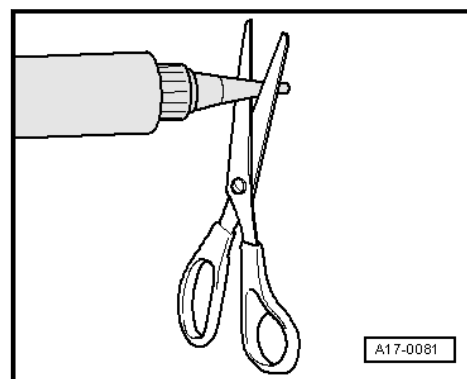


### Note

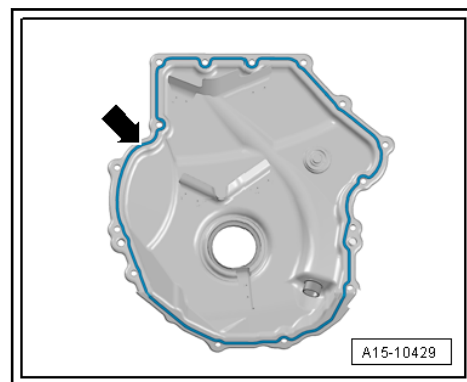
- ◆ *If the distance is greater than 0.2 mm, the cover must be replaced.*
- ◆ *It is not possible to measure the distance between the cover and the upper section of the oil pan, however perform a visual inspection of the sealing surface for evenness.*
- Make sure both alignment bushings for centering the cover -arrows- are present.



- Cut the tube nozzle at the front marking (nozzle diameter: approximately 3 mm).



- Apply silicone sealant on the clean sealing surface of the cover as shown.



- Sealant bead thickness: 2 to 3 mm.



#### Note

- ◆ *The cover must be installed within five minutes after application of Silicone Sealant.*
- ◆ *The sealant bead may not be thicker than specified, otherwise excess sealant could enter the oil pan and clog the oil intake pipe screen.*
- ◆ *Be sure to check the expiration date of the sealant.*
- Mount the cover immediately and tighten the new bolts. Refer to [⇒ Fig. “Lower Timing Chain Cover - Tightening Specifications and Tightening Sequence”](#), page 116 .



#### Note

*After installing cover, allow sealant to dry for approximately 30 minutes. Only afterward may the engine oil be replenished.*

- Refill engine oil. Refer to ⇒ Maintenance; Booklet 20.1.
- Check the oil level. Refer to ⇒ [O1.2 il", page 193](#) .

Further assembly is performed in the reverse order of the removal.

#### Tightening Specification

- ◆ Refer to ⇒ [-2.1 Timing Chain Cover", page 114](#)
- ◆ Refer to ⇒ [-1.1 Turbocharger", page 266](#)
- ◆ Refer to ⇒ [-1.1 Ribbed Belt Drive", page 42](#)



### 3 Chain Drive

⇒ [-3.1 Camshaft Timing Chains", page 125](#)

⇒ [-3.2 Balance Shaft Drive Chain", page 127](#)

⇒ [T3.3 Timing Chain, Removing and Installing", page 130](#)

⇒ [S3.4 Crankshaft Drive Chain, Removing and Installing", page 146](#)

⇒ [C3.5 Camshaft Balance Shaft, Removing and Installing", page 149](#)

⇒ [C3.6 Camshaft Balance Shaft, Removing and Installing", page 152](#)

⇒ [T3.7 Timing, Checking", page 155](#)

#### 3.1 Overview - Camshaft Timing Chains



**1 - Bolt**

- 9 Nm

**2 - Chain Tensioner**

- Is under tension
- Secure with the Locking Pin (3 pc.) -T40011- before removing

**3 - Timing Chain Tensioning Rail**

**4 - Guide Pin**

- 20 Nm

**5 - Bolt**

- 9 Nm

**6 - Control Valve**

- 35 Nm
- Left-hand thread
- Remove with the Central Valve Assembly Tool -T10352-.

**7 - Bolt**

- M6 bolt: 8 Nm +90° turn
- M8 bolt: 20 Nm +90° turn
- Replace after removing

**8 - Washer**

**9 - Bearing Bracket**

**10 - Camshaft Timing Chain Guide Rail**

**11 - Camshaft Housing**

**12 - Camshaft Timing Chain**

- Before removing, mark the running direction with paint
- Removing and installing. Refer to ⇒ [T3.3 iming Chain, Removing and Installing](#), page 130 .

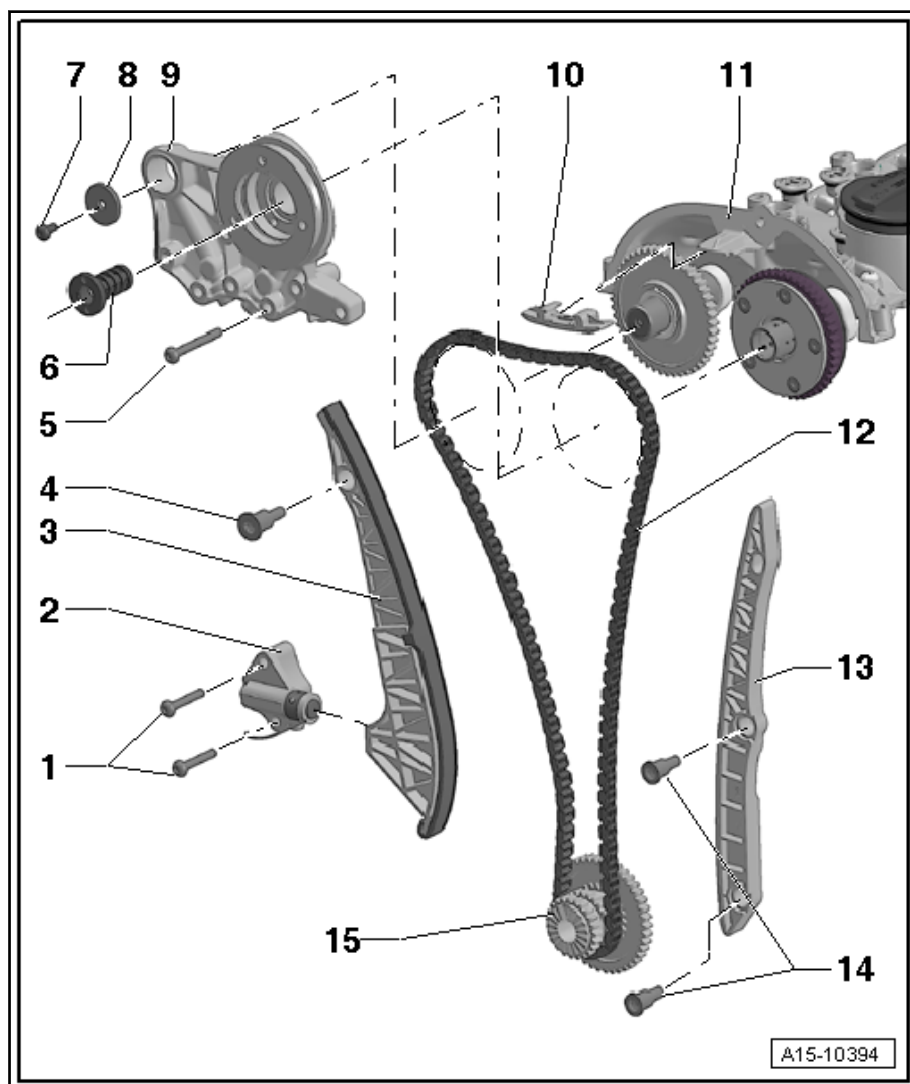
**13 - Camshaft Timing Chain Guide Rail**

**14 - Guide Pin**

- 20 Nm

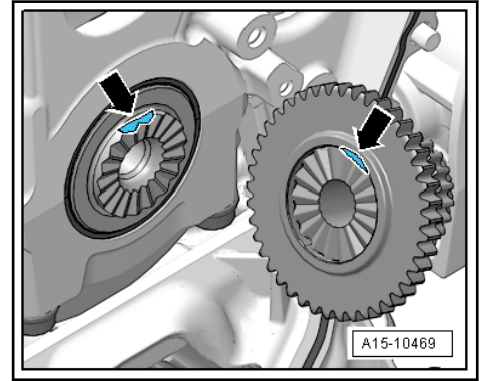
**15 - Chain Sprocket Crankshaft**

- Note the installation position. Refer to ⇒ [Fig. “Chain Sprocket Crankshaft, Installation Position”](#), page 126 .



**Chain Sprocket Crankshaft, Installation Position**





- Both surfaces -arrows- must align across from each other.

### 3.2 Overview - Balance Shaft Drive Chain



**1 - Bolt**

- ☐ 9 Nm

**2 - Balance Shaft**

- ☐ Replace after removing
- ☐ Exhaust side
- ☐ Lubricate the bearing with engine oil
- ☐ Removing and installing. Refer to ➤ [C3.6 amshaft Balance Shaft, Removing and Installing](#), page 152.

**3 - Balance Shaft Pipe**

- ☐ Note the installation position. Refer to ➤ [page 153](#).

**4 - Chain Tensioner**

- ☐ 85 Nm
- ☐ Install with locking compound. Refer to Parts Catalog.

**5 - Cylinder Block**

**6 - Balance Shaft**

- ☐ Replace after removing
- ☐ Intake side
- ☐ Lubricate the bearing with engine oil
- ☐ Removing and installing. Refer to ➤ [C3.5 amshaft Balance Shaft, Removing and Installing](#), page 149.

**7 - O-Ring**

- ☐ Replace after removing
- ☐ Lubricate with engine oil

**8 - Mounting Pin**

- ☐ Lubricate with engine oil
- ☐ Note the installation position. Refer to ➤ [Fig. "Mounting Pins - Installation Position"](#), page 129.

**9 - Intermediate Shaft Sprocket**

- ☐ For the balance shaft
- ☐ The intermediate shaft sprocket must be replaced if the bolt is loosened.

**10 - Bolt**

- ☐ 9 Nm

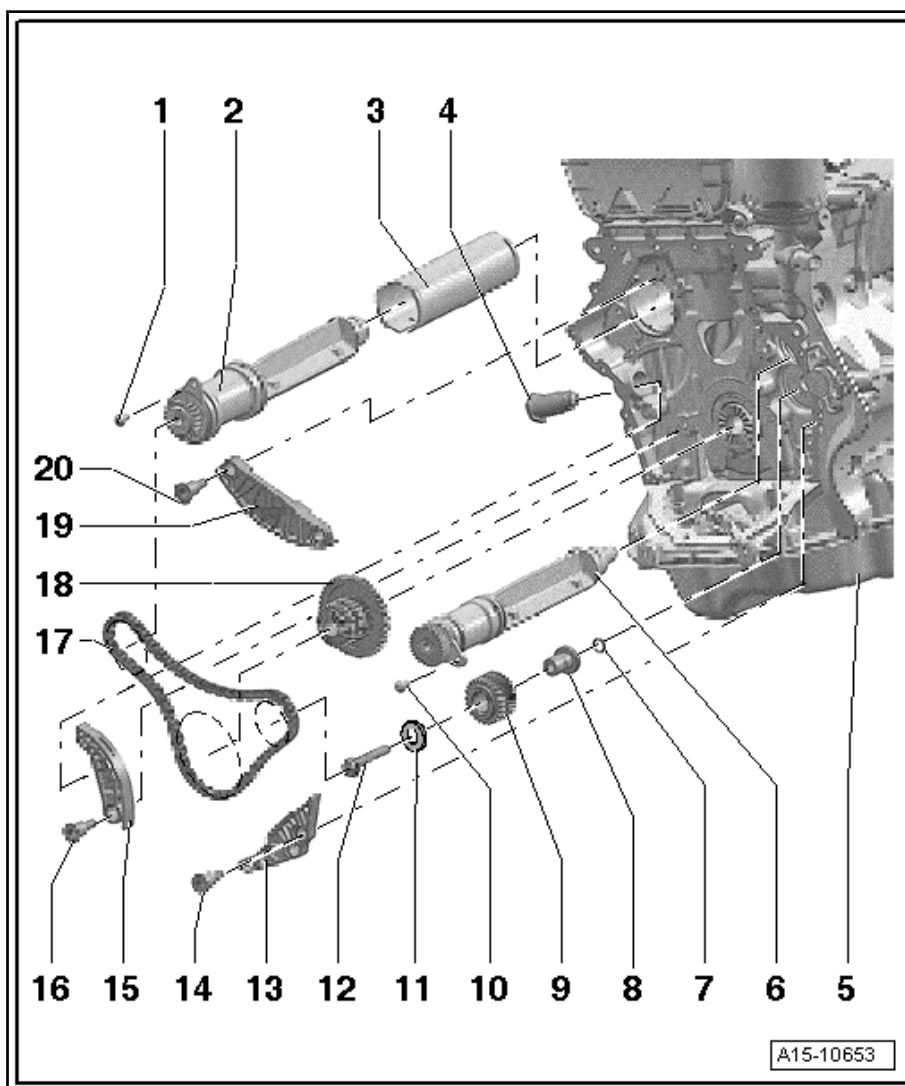
**11 - Washer**

**12 - Bolt**

- ☐ Replace after removing
- ☐ The intermediate shaft sprocket must be replaced if the bolt is loosened.
- ☐ Tightening sequence and specification. Refer to ➤ [Fig. "Intermediate Shaft Sprocket - Tightening Sequence and Tightening Specification"](#), page 129.

**13 - Guide Rail**

- ☐ For the timing chain



**14 - Guide Pin**

- ☐ 20 Nm

**15 - Tensioning Rail**

- ☐ For balance shaft drive chains

**16 - Guide Pin**

- ☐ 20 Nm

**17 - Balance Shaft Drive Chain**

- ☐ Removing and installing. Refer to [⇒ S3.4 haft Drive Chain, Removing and Installing](#), page 146 .

**18 - Chain Sprocket Crankshaft**

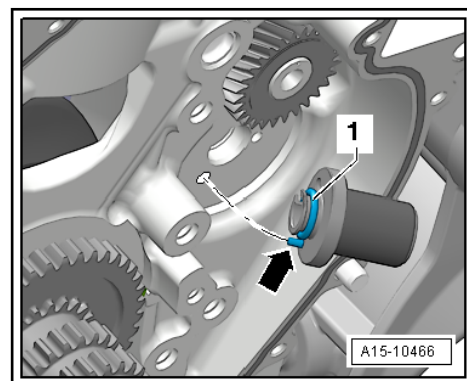
- ☐ Note the installation position. Refer to [⇒ Fig. ""Chain Sprocket Crankshaft, Installation Position""](#), page 126 .

**19 - Guide Rail**

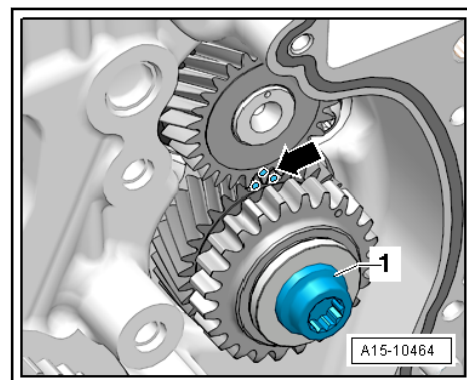
- ☐ For balance shaft drive chains

**20 - Guide Pin**

- ☐ 20 Nm

**Mounting Pins - Installation Position**

- Replace and lubricate the O-ring -1-.
- The alignment pin -arrow- for the bearing pins must engage in the hole in the cylinder block.
- Lubricate the bearing pins

**Intermediate Shaft Sprocket - Tightening Sequence and Tightening Specification**

**The Intermediate Shaft Sprocket Must Always Be Replaced, Otherwise the Backlash Cannot Adjust Itself Which Causes Damage to the Engine.**

The new intermediate shaft sprocket has an anti-friction coating that wears off after a short period of use, which automatically adjusts the backlash.

- Tighten the new bolts in the following steps:

| Step  | Bolts | Tightening Specification/Additional Turn |
|---|-------|--|
| 1   | -1-   | 10 Nm                                    |
| 2   | -1-   | Turn the chain sprocket                  |
| Chain sprocket cannot have any play. If it does, loosen and tighten it again. |       |  |
| 3   | -1-   | 30 Nm                                    |
| 4   | -1-   | 90° additional turn                      |

### 3.3 Camshaft Timing Chain, Removing and Installing

#### Special tools and workshop equipment required

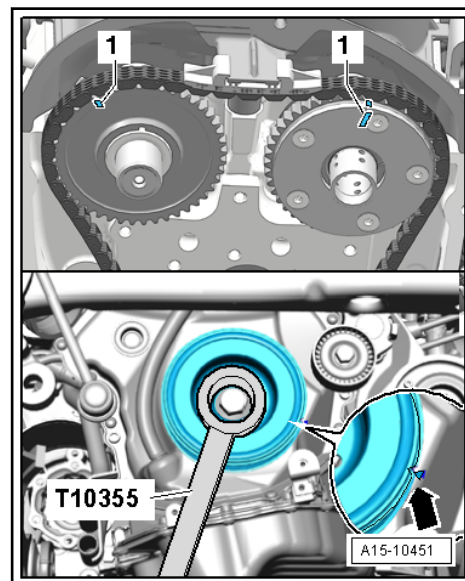
- ◆ Central Valve Assembly Tool -T10352-
- ◆ Central Valve Assembly Tool -T10352- (Engine code CCZA: Central Valve Assembly Tool -T10352/1-)
- ◆ Counterhold - Vibration Damper -T10355-
- ◆ Locking Pin (3 pc.) -T40011-
- ◆ Chain Tensioner Lever -T40243-
- ◆ Tensioner Locking Tool -T40267-
- ◆ Camshaft Locks -T40271-
- ◆ Vibration Damper Assembly Tool -T10531-

Individual components of the Vibration Damper Assembly Tool -T10531-:

- ◆ Vibration Damper Assembly Tool - Counterhold Tool - T10531/1-
- ◆ Vibration Damper Assembly Tool - Tensioning Pins - T10531/2-
- ◆ Vibration Damper Assembly Tool - Turning Over Tool - T10531/3-
- ◆ Vibration Damper Assembly Tool - Knurled Nut -T10531/4-

#### Removing

- Remove the upper timing chain cover. Refer to [⇒ T2.2 Timing Chain Cover, Removing and Installing](#), page 117 .
- Turn the vibration damper into “TDC” -arrow- using the Counterhold - Vibration Damper -T10355A-.

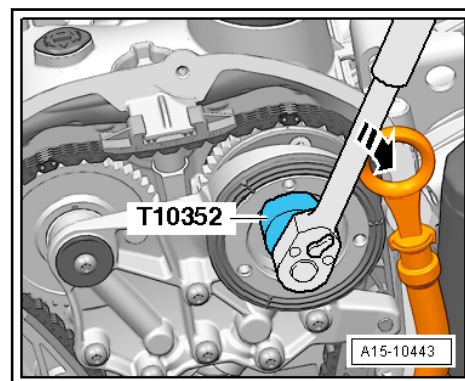


- The notch on the vibration damper must align with the arrow marking on the lower timing chain cover.
- The markings -1- on the camshafts must point upward.
- Remove the vibration damper. Refer to [⇒ D1.4 amper, Removing and Installing](#), page 49 .
- Remove the lower timing chain cover. Refer to [⇒ T2.3 iming Chain Cover, Removing and Installing](#), page 118 .

**Note**

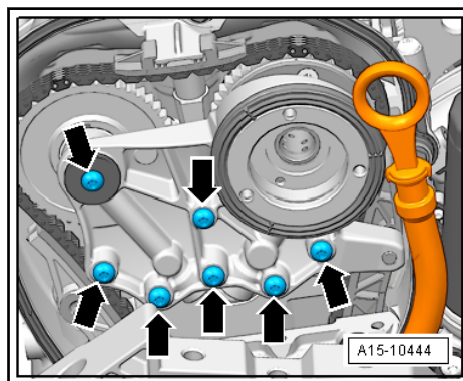
*The control valve has left-hand thread.*

- Remove the control valve in the direction of -arrow- using the -T10352- (for engine code CCZA, use -T10352/1-).

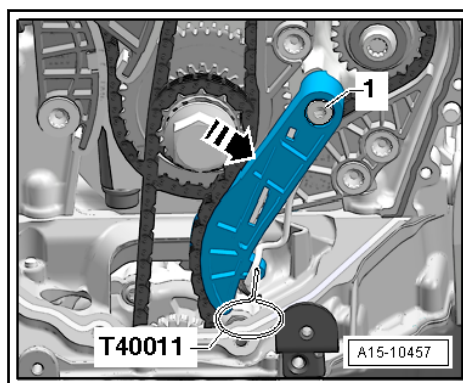
**Note**

*The control valves have left-hand thread. Turn clockwise to loosen.*

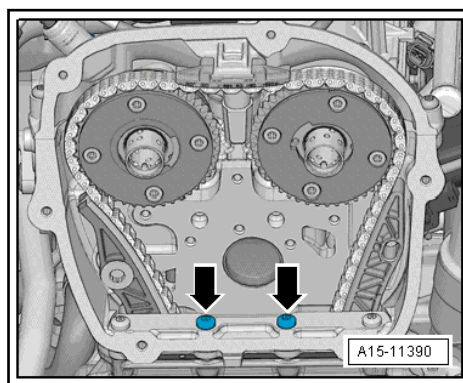
- Remove the bolts -arrows- and remove the bearing bracket.



- Press the oil pump chain tensioner in the direction of -arrow- and secure it with a -T40011-.

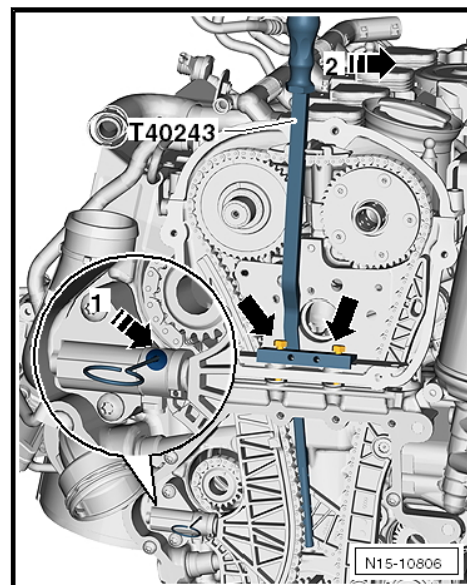


- Remove the drive chain tensioner -1-.
- Remove the bolts -arrows-.





Two different chain tensioners may be installed depending on the version, Version 1:



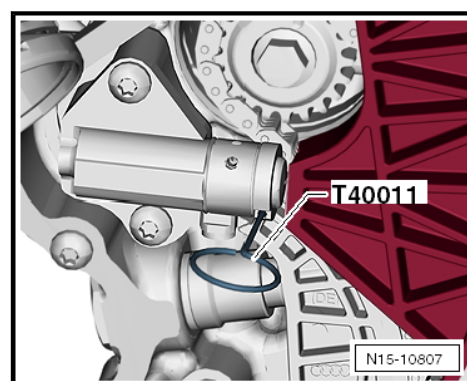
- Install the -T40243- -arrows-.
- Lift up the locking wedge for the chain tensioner -arrow 1-. Sand the end of the -T40011- down to a point. A screwdriver with a blade width of approximately 1.5 mm can also be used.



#### Note

*There is a risk of damaging the chain tensioner. Proceed very carefully.*

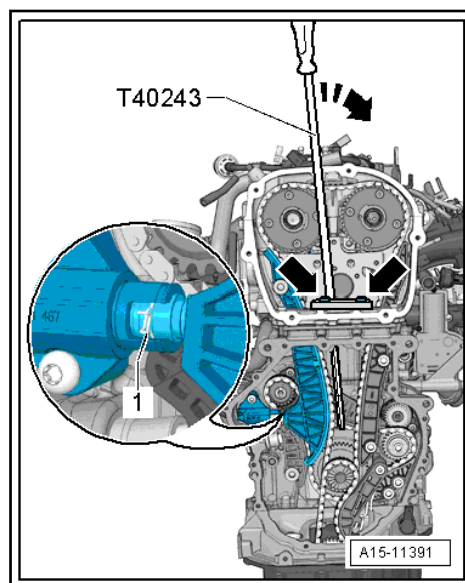
- Slowly press and hold the -T40243- in the direction of -arrow 2-.
- Secure the chain tensioner using the -T40011-.



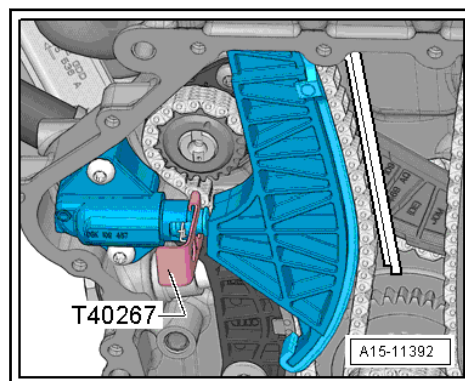




**Version 2:**



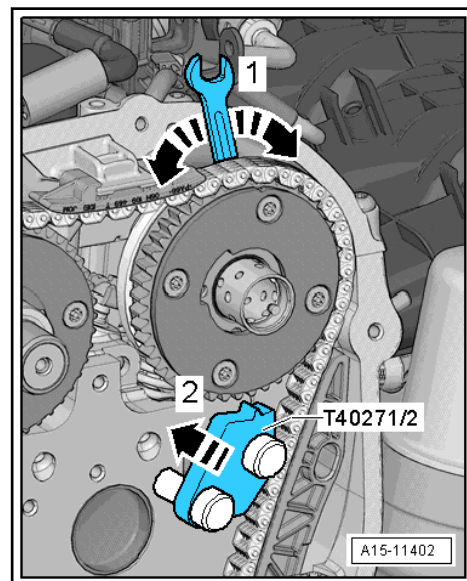
- Install the -T40243- -arrows-.
- Press the chain tensioner circlip -1- together and hold it.
- Slowly press and hold the -T40243- in the direction of -arrow-.
- Secure the chain tensioner with the -T40267-.



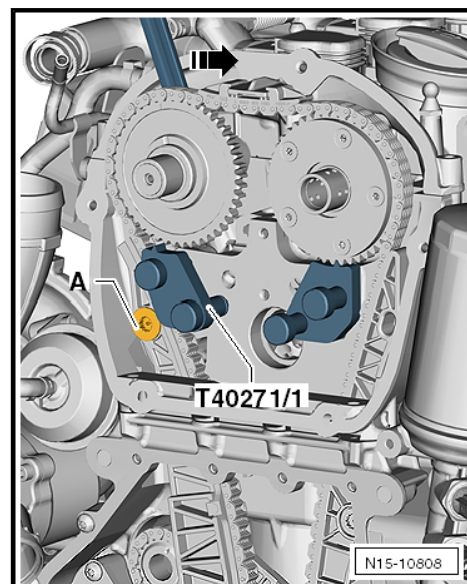
**All**

- Remove the -T40243-.
- Bolt the -T40271/2- to the cylinder head and into the splines on the chain sprocket in the direction of the -arrow 2-. If necessary, turn the intake camshaft slightly with a wrench in direction of -arrows 1-.

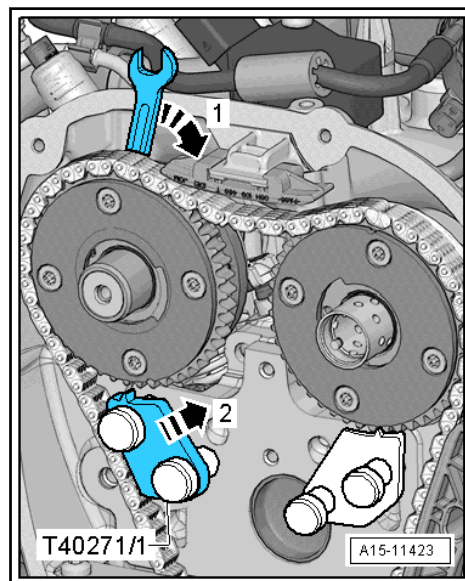




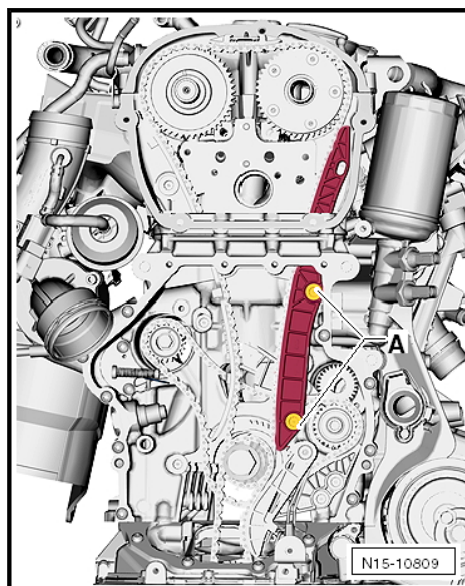
- Install the -T40271/1- on the cylinder head. Hold the camshaft clockwise -arrow- using a wrench.



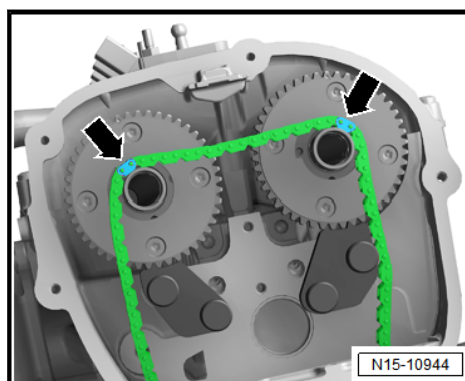
- Remove the bolt -A- and remove the tensioning rail while continuing to hold the camshaft.
- Slide the -T40271/1- into the chain sprocket splines -2-. If necessary, turn the exhaust camshaft -1- farther clockwise, until the camshaft locating tool can be pushed in. The camshaft timing chain must be »loose« between the chain sprockets.



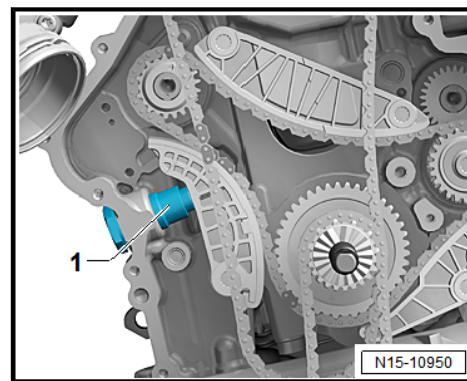
- Remove the bolts -A- and then remove the camshaft timing chain guide rail.



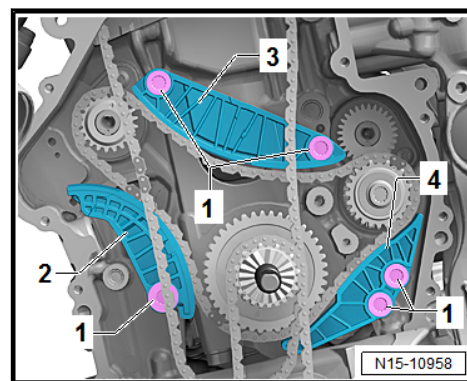
- Remove the camshaft timing chain from the camshaft sprockets and hang it on the camshaft pins -arrows-.



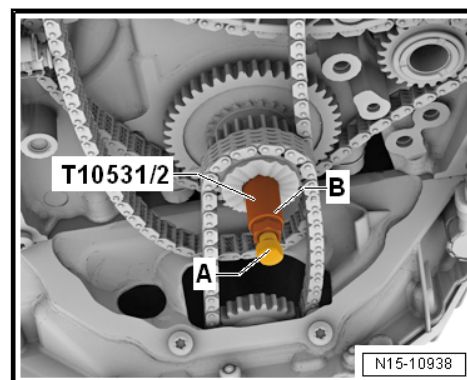
- Remove the chain tensioner -1- for the drive chain balance shaft.



- Remove the bolts -1-. Remove the tensioning rail -2- and the guide rails -3 and 4-.



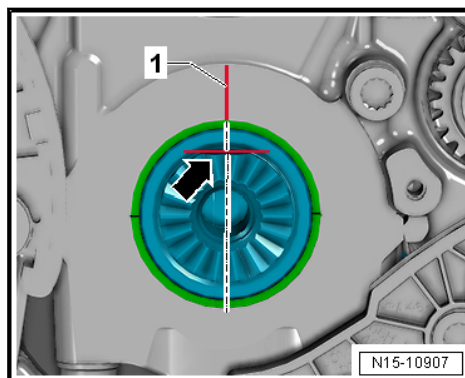
- Loosen the adjusting bolt -A- and remove the tensioning pin -B-.



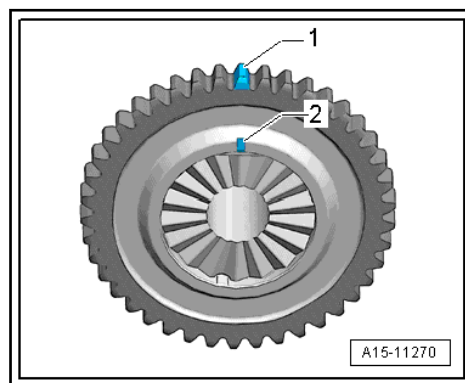
- Remove the three stage chain sprocket by removing the drive chain for the oil pump.
- Remove the camshaft timing chain.



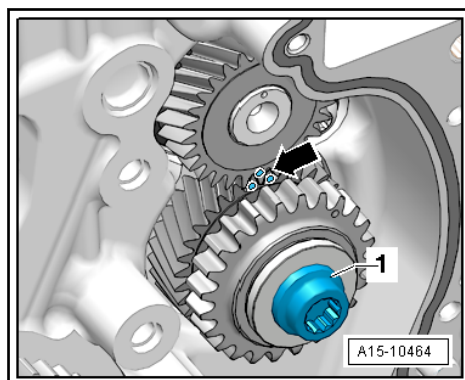
## Installing



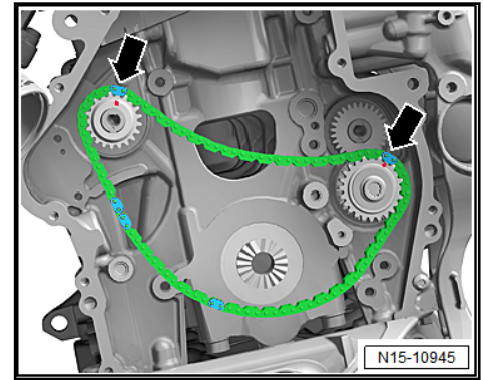
- Tightening specifications. Refer to [⇒ -3.1 Camshaft Timing Chains](#), [page 125](#).
- Check that the crankshaft is at TDC. The flat area on the crankshaft -arrow- must be horizontal.
- Draw the markings on the cylinder block -1-, as shown, with a waterproof marker.
- Draw a marking -2- on the three stage chain sprocket tooth -1- with a waterproof marker.



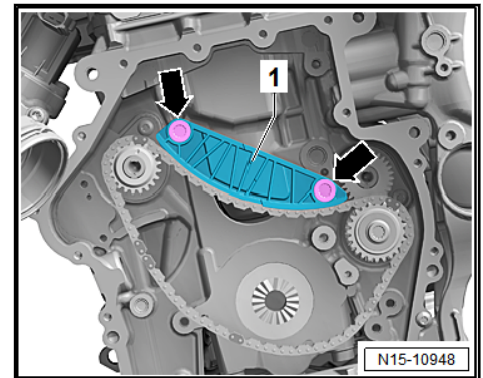
- Turn the intermediate sprocket and balance shaft to the marks -arrow-, but do not loosen the bolt -1-. The markings on the intermediate sprocket and the balance shaft are difficult to see and align only every 7th turn.



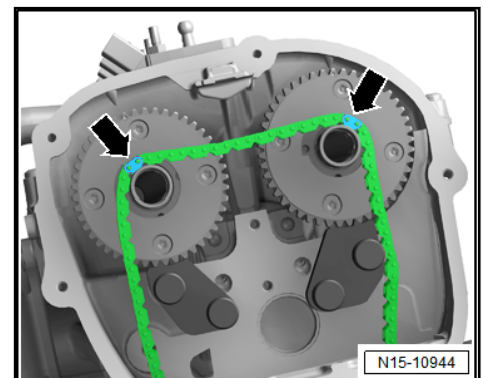
- Lay the balance shaft drive chain, and position the painted links -arrows- on the chain sprocket markings.



- Install the guide rail -1- and tighten the bolts -arrows-.

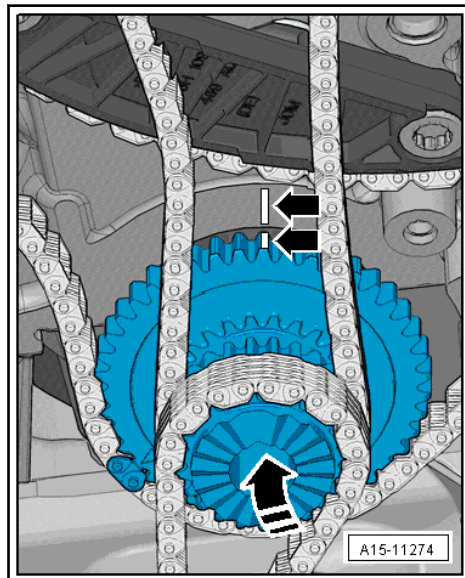


- Engage the camshaft timing chain with the painted links -arrows- on the camshaft pins.

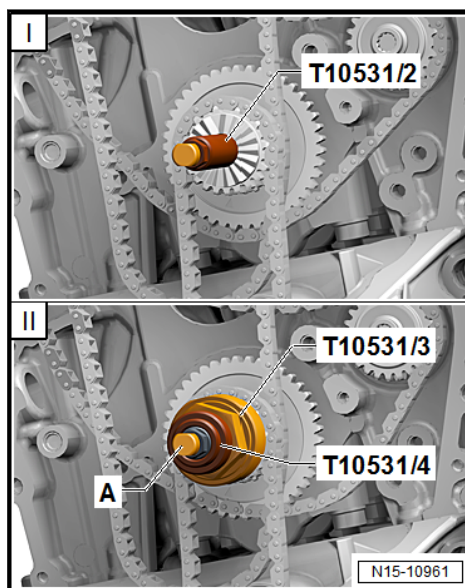


- Lay the oil pump drive chain on the three-stage chain sprocket.





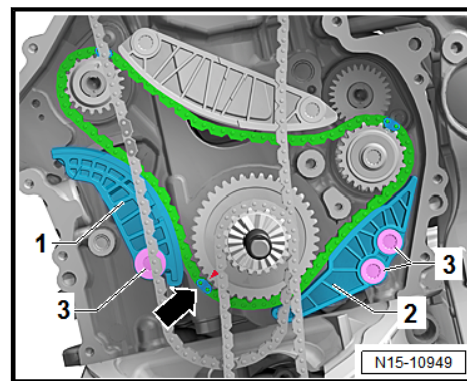
- Tilt the three stage chain sprocket in the direction of -arrow- toward the engine and secure it to the crankshaft. The marks -arrows- must be positioned opposite each other.



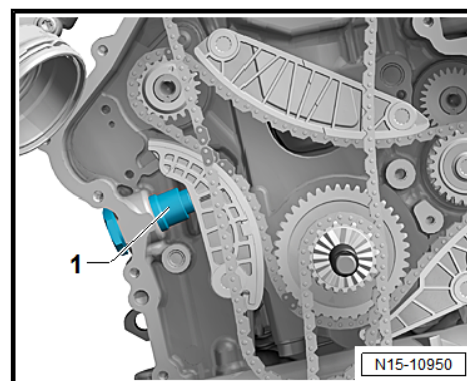
I - Install the -T10531/2- in the crankshaft and tighten hand-tight.

II - Install the -T10531/3-. Tighten the -T10531/4- hand-tight. Using a 32 mm open end wrench move the -T10531/3- back and forth slightly while doing this tighten the -T10531/4- until the chain sprocket is seated securely on the crankshaft splines. Now tighten the adjusting bolt -A-.

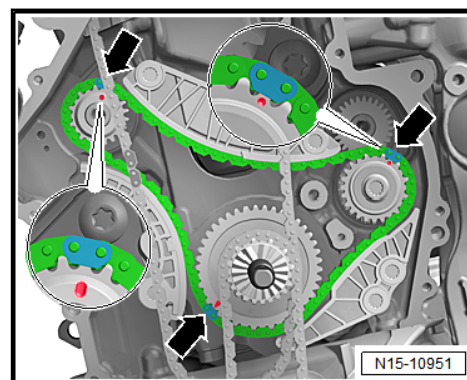
- Position the painted chain link in the balance shaft drive chain -arrow- at the mark on the three stage chain sprocket. Install the tensioning rail -1- and the guide rail -2-. Tighten the bolts -3-.



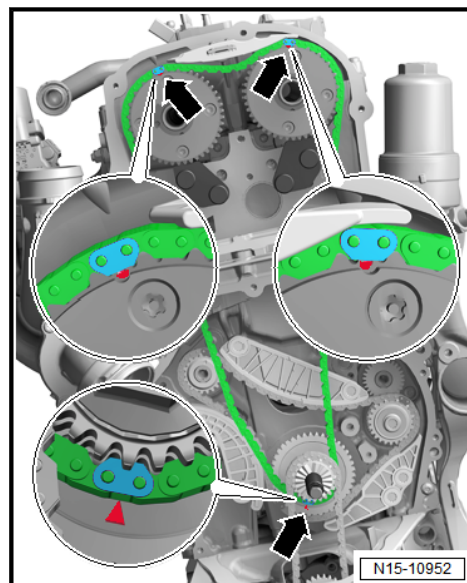
- Install the chain tensioner -1-.



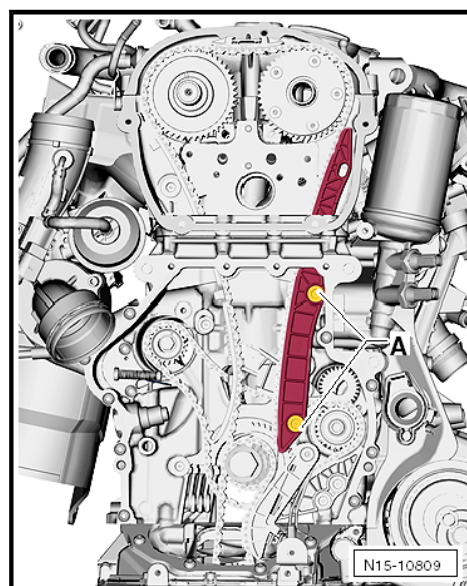
- Check the adjustment again. The painted chain links -arrows- must line up with the markings on the chain sprockets.



- Place the camshaft timing chain on the intake camshaft, exhaust camshaft and the crankshaft. Position the painted chain links -arrows- on the markings on the chain sprockets.



- Install the camshaft timing chain guide rail and tighten the bolts -A-.

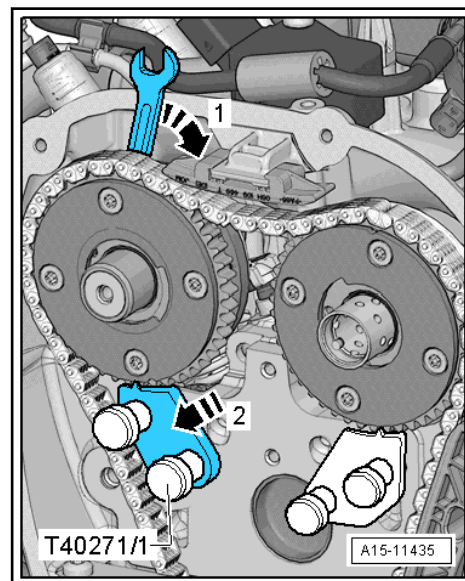


#### Note

*Use the help of a second technician to hold the exhaust camshaft in place.*

- Slowly turn the exhaust camshaft in the direction of the -arrow 1- until the -T40271/1- can be pulled from the chain sprocket splines.



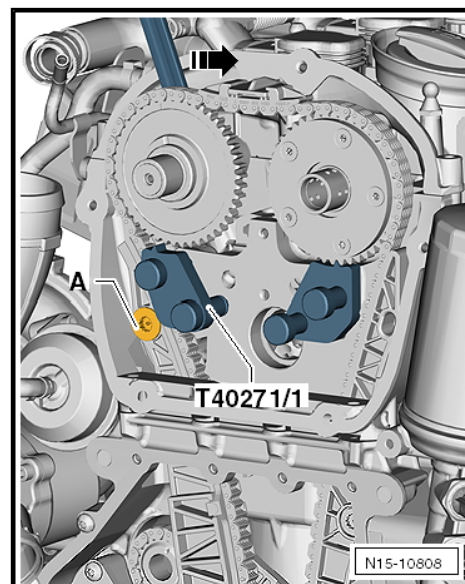


- Carefully release the camshaft, until the camshaft timing chain is laying on the upper guide rail. Hold the camshaft in this position.

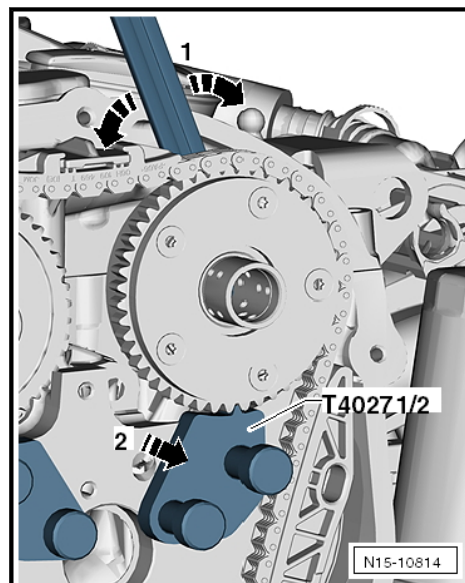
**Note**

*Always check before installing the tensioning rail, whether the colored chain link is still aligned to the markings on the camshaft!*

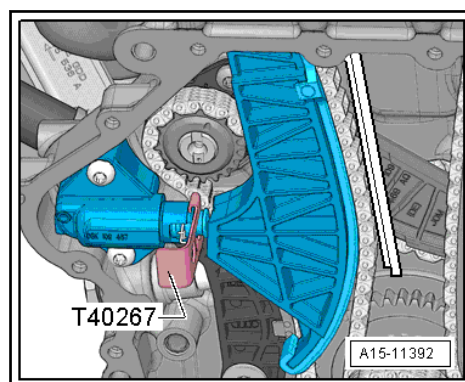
- Continue to hold the camshaft and install the camshaft timing chain tensioning rail. Tighten the bolt -A-.



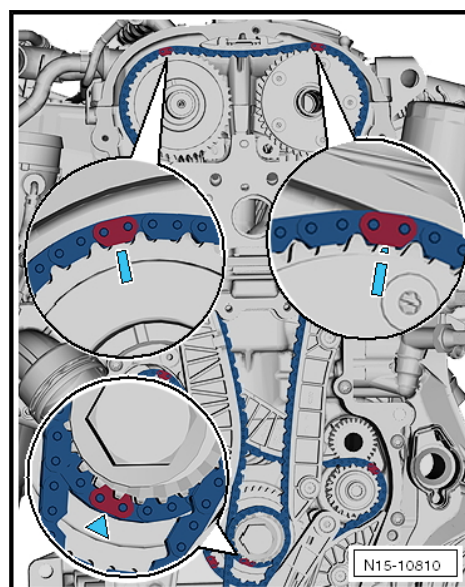
- Remove the -T40271/1-.
- Slide the -T40271/2- out of the chain sprocket splines in direction of -2-. If necessary, slightly turn the intake camshaft with the wrench in direction of -arrows 1-.



- Remove the -T40271/2-.
- Depending on the version, remove either the -T40011- or the -T40267-.

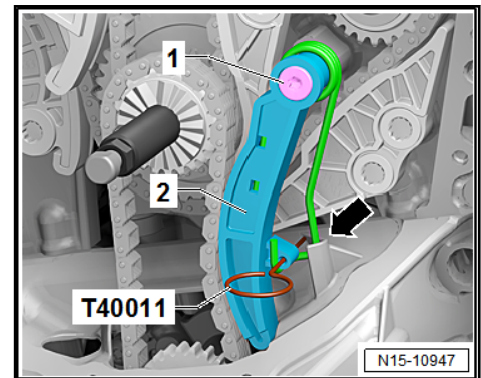


- Check that the position of the colored chain link is aligned to the markings.

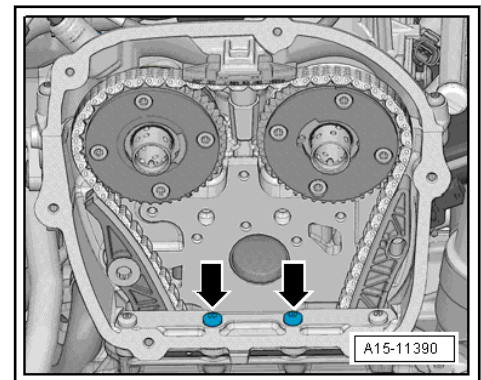




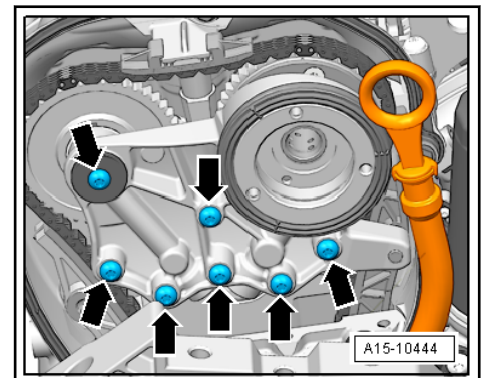
- Install the chain tensioner -2-. The wire clip -arrow- must come in to contact with the oil pan upper section opening. Tighten the bolt -1- and remove the -T40011-.



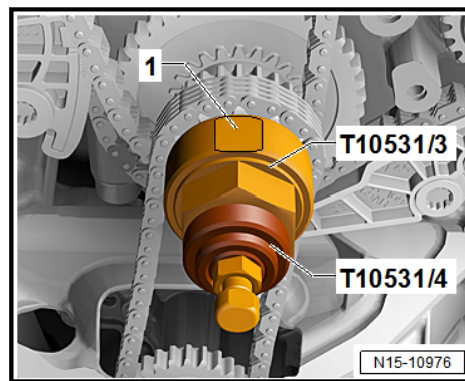
- Install the bolts -arrows- and tighten them.



- Carefully mount the bearing bracket without tilting it. Hand-tighten the bolts -arrows-.



- Tighten the bolts -arrows-. Refer to [⇒ -3.1 Camshaft Timing Chains-, page 125](#).
- Install the control valve -item 6- [⇒ Item 6 \(page 126\)](#).
- Turn the crankshaft with a SW 32 open end wrench on the -T10531/3- two times in the direction of engine rotation. In the “TDC point” the flat area -1- points upward.



#### Note

*Due to the ratio, the painted chain links no longer match up after the engine has been turned.*

Further assembly is performed in the reverse order of the removal.

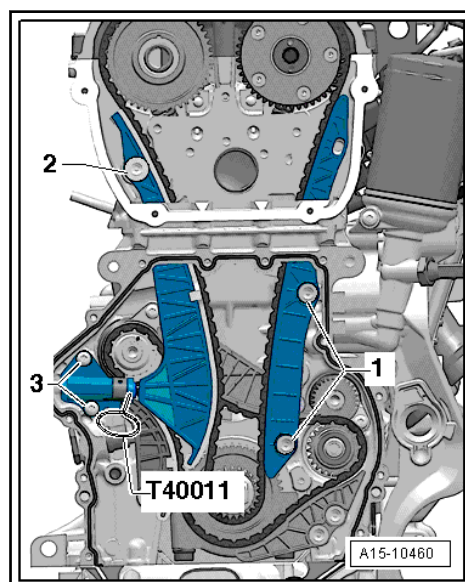
### 3.4 Balance Shaft Drive Chain, Removing and Installing

#### Special tools and workshop equipment required

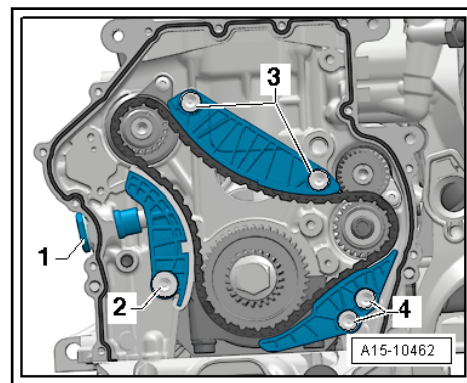
- ◆ Locking Pin (3 pc.) -T40011-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-

#### Removing

- Remove the camshaft timing chain. Refer to [⇒ T3.3 Timing Chain, Removing and Installing](#), page 130 .
- Remove the guide rail for the camshaft timing chain -1-.



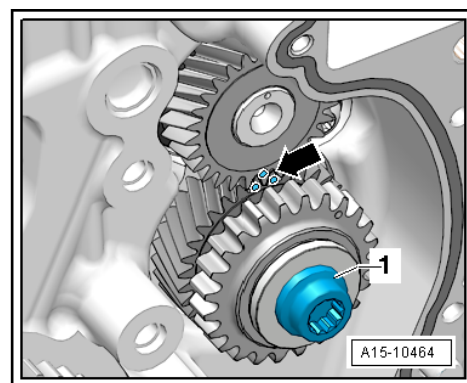
- Remove the camshaft timing chain tensioner -3-.
- Remove the chain tensioner for the balance shaft drive chain -1-.



- Remove the tensioning rail -2-.
- Remove the guide rail -3-.
- Remove the guide rail -4-.
- Remove the timing chain.

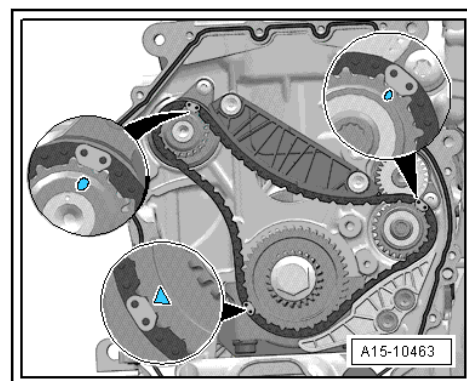
#### Installing

- Turn the intermediate shaft sprocket/balance shaft to the marking -arrow-.



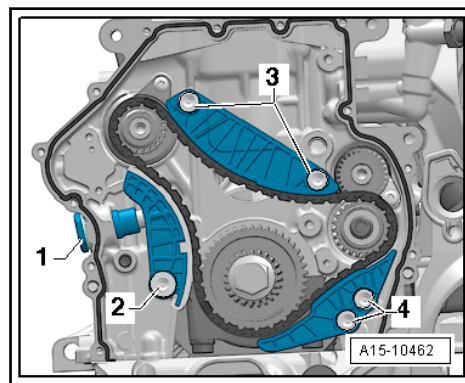
#### Note

- ◆ *The painted links of the timing chain must be positioned on the markings on the chain sprockets.*
- ◆ *Due to the ratio, the markings only align after every 7th turn.*
- Mount the timing chain; the painted links of the timing chain must be positioned on the markings on the chain sprockets.

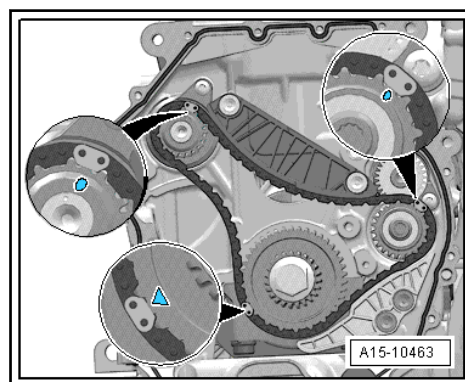


- Install the timing chain tensioning rail and tighten the bolt -2-.

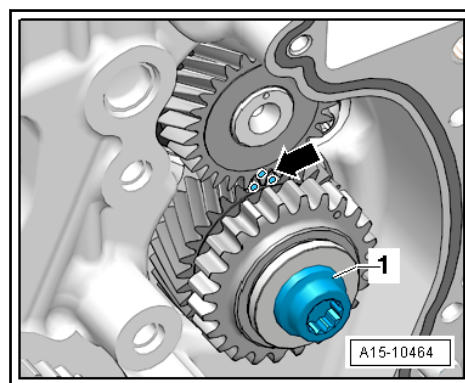




- Install the timing chain guide rail and tighten the bolts -4-.
- Install the timing chain guide rail and tighten the bolts -3-.
- Install the timing chain tensioner -1- with locking compound. Refer to Parts Catalog.
- Check the position again.



- Check the markings on the intermediate shaft sprocket/balance shaft -arrow-.



#### Note

*The marking on the intermediate shaft sprocket/balance shaft is shown with the chain removed.*

Further assembly is performed in the reverse order of the removal.

#### Tightening Specification

- ◆ Refer to ➔ [-2.1 Timing Chain Cover-, page 114](#)



- ◆ Refer to ⇒ [-3.1 Camshaft Timing Chains”, page 125](#)
- ◆ Refer to ⇒ [-3.2 Balance Shaft Drive Chain”, page 127](#)

### 3.5 Intake Camshaft Balance Shaft, Removing and Installing

Special tools and workshop equipment required

- ◆ Puller - Balancer Shaft -T10394-
- ◆ Puller - Unit Injector -T10055-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-

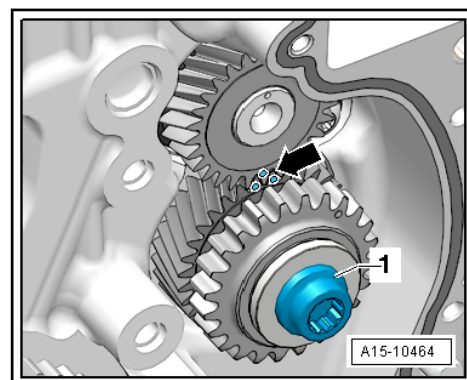


#### Note

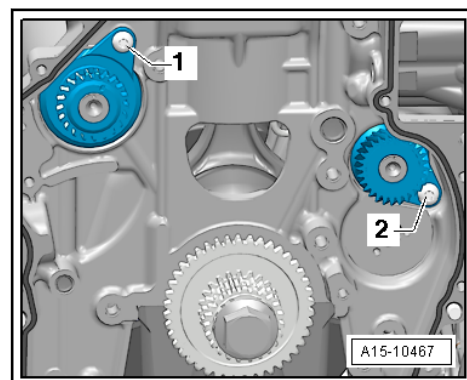
*Always replace the balance shaft after removing it.*

#### Removing

- Remove the balance shaft drive chain. Refer to ⇒ [S3.4 haft Drive Chain, Removing and Installing”, page 146](#) .
- Remove the coolant pump toothed belt. Refer to ⇒ [P2.6 ump Toothed Belt, Removing and Installing”, page 241](#) .
- Remove the intermediate sprocket -1-.

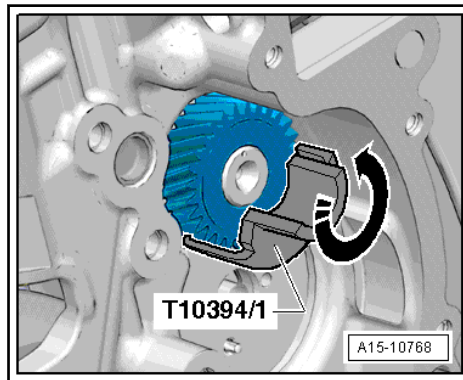


- Remove the bolt -2- for the intake camshaft balance shaft and remove the balance shaft.

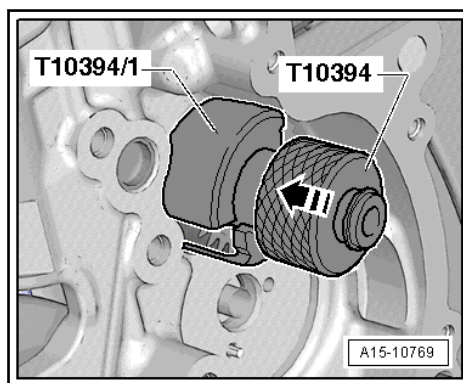


**If the Balance Shaft Cannot Be Removed by Hand, Use the Puller - Balancer Shaft -T10394-:**

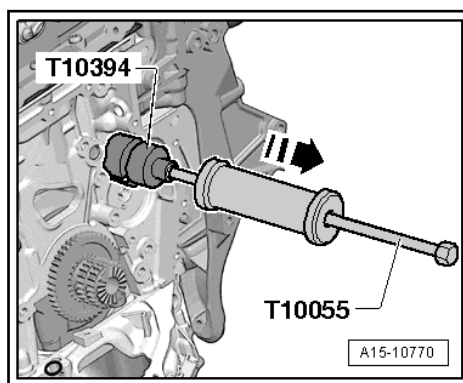
- Insert the Puller - Balancer Shaft - Puller Jaw -T10394/1- from the Puller - Balancer Shaft -T10394- and turn upward in direction of -arrow-.



- Insert the Puller - Balancer Shaft -T10394- and push the sliding sleeve in the direction of -arrow-.



- Install the Puller - Unit Injector -T10055- into the Puller - Balancer Shaft -T10394- and remove the balance shaft in the direction of -arrow-.



## Installing



### Note

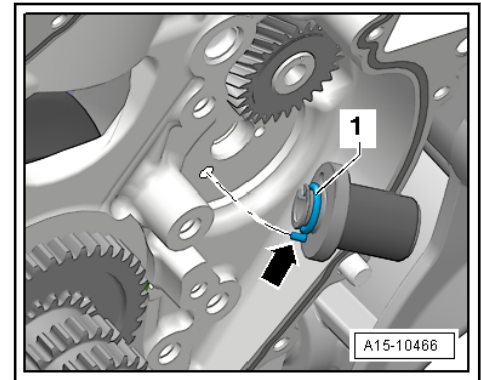
*Because of the small clearance between the balance shaft and cylinder block, the balance shaft may need to be cooled in order to install it. Check if the balance shaft can be inserted into the cylinder block without forcing it in. If it cannot, then the balance shaft must be cooled before installing it.*

- Place the new balance shaft in a freezer for 30 minutes or spray it with commercially available cooling spray.
- Lubricate the balance shaft bearing with engine oil.
- Install the intake camshaft balance shaft.





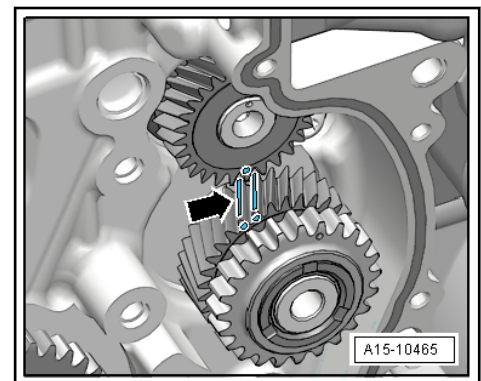
- Replace the O-ring -1- and coat with engine oil.



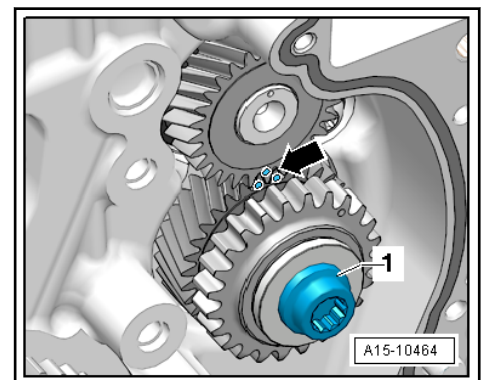
- Coat the mounting pin with engine oil and insert it. The alignment pin -arrow- for the mounting pin must engage in the hole in the cylinder block.

Always replace the intermediate shaft sprocket. Otherwise the backlash will not adjust itself and it could result in engine damage. The new intermediate shaft sprocket has an anti-friction coating that wears off after a short period of use, which automatically adjusts the backlash.

- Mark the tooth face on the intermediate sprocket -arrows-.



- Install the intermediate sprocket; the marking on the balance shaft must be between the markings on the tooth faces.
- Tighten the chain sprocket bolt -1-. Refer to ⇒ [Fig. “Intermediate Shaft Sprocket - Tightening Sequence and Tightening Specification”](#), page 129.



- Check the markings on the intermediate shaft sprocket/balance shaft -arrow-.



#### Note

*Due to the ratio, the markings only align after every 7th turn.*

- Install the balance shaft drive chain. Refer to [⇒ page 147](#) .
- Replace the coolant pump drive seal. Refer to [⇒ P2.7 ump Drive Gear Sealing Ring, Replacing](#) , page 243 .

Further assembly is performed in the reverse order of removal, but observe the following:

#### Tightening Specification

- ◆ Refer to [⇒ -2.1 Timing Chain Cover](#) , page 114
- ◆ Refer to [⇒ -3.1 Camshaft Timing Chains](#) , page 125
- ◆ Refer to [⇒ -3.2 Balance Shaft Drive Chain](#) , page 127

### 3.6 Exhaust Camshaft Balance Shaft, Removing and Installing

#### Special tools and workshop equipment required

- ◆ Puller - Balancer Shaft -T10394-
- ◆ Puller - Unit Injector -T10055-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-

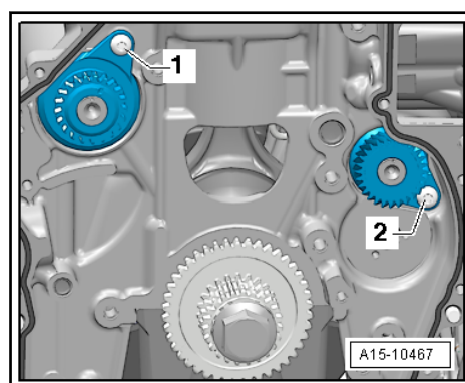


#### Note

*Always replace the balance shaft after removing it.*

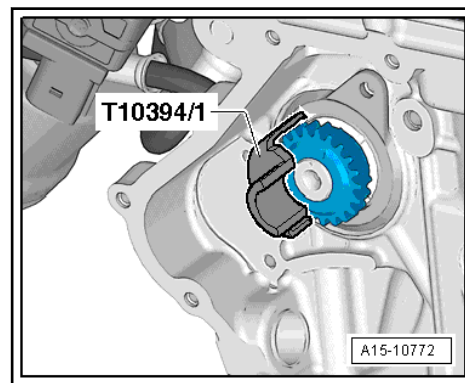
#### Removing

- Remove the balance shaft drive chain. Refer to [⇒ S3.4 haft Drive Chain, Removing and Installing](#) , page 146 .
- Remove the bolt -1- and the balance shaft.

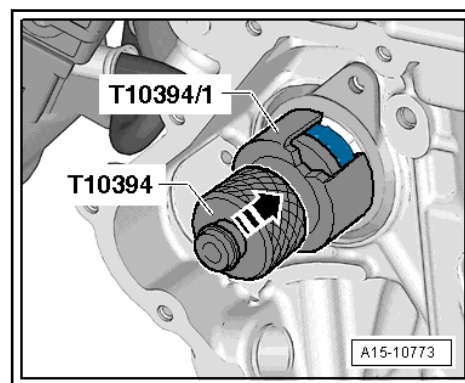


#### If the Balance Shaft Cannot Be Removed by Hand, Use the Puller - Balancer Shaft -T10394-:

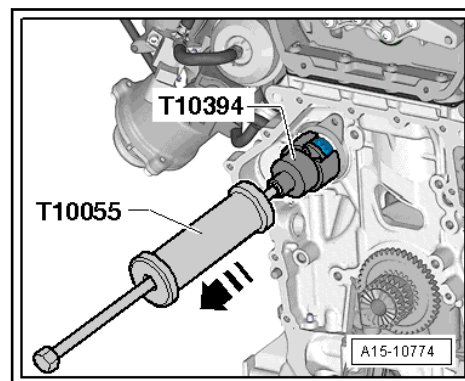
- Insert the Puller - Balancer Shaft - Puller Jaw -T10394/1- from the Puller - Balancer Shaft -T10394-.



- Insert the Puller - Balancer Shaft -T10394- and push the sliding sleeve in the direction of -arrow-.



- Install the Puller - Unit Injector -T10055- into the Puller - Balancer Shaft -T10394- and remove the balance shaft.



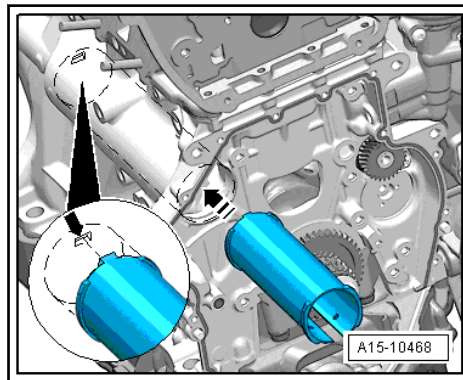
## Installing



### Note

*Because of the small clearance between the balance shaft and cylinder block, the balance shaft may need to be cooled in order to install it. Check if the balance shaft can be inserted into the cylinder block without forcing it in. If it cannot, then the balance shaft must be cooled before installing it.*

- Check the installation position for the balance shaft pipe -arrow-.

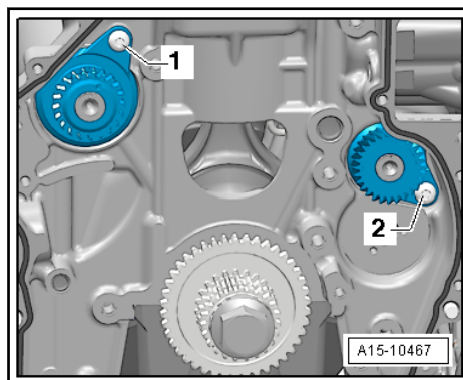


- The pin from the balance shaft pipe must fit into the groove -arrow-



#### Note

- ◆ *Press the pipe together slightly to position it in the installation position.*
- ◆ *Press the pipe in the crankcase and bend both halves inward one time.*
- Place the new balance shaft in a freezer for 30 minutes or spray it with commercially available cooling spray.
- Lubricate the balance shaft bearing with engine oil.
- Install the exhaust camshaft balance shaft.
- Before tightening the bolt -1- make sure the balance shaft lies level on the crankcase.



#### Note

*If the balance shaft is not level, then the pipe for the balance shaft must be installed again.*

Further assembly is performed in the reverse order of the removal.

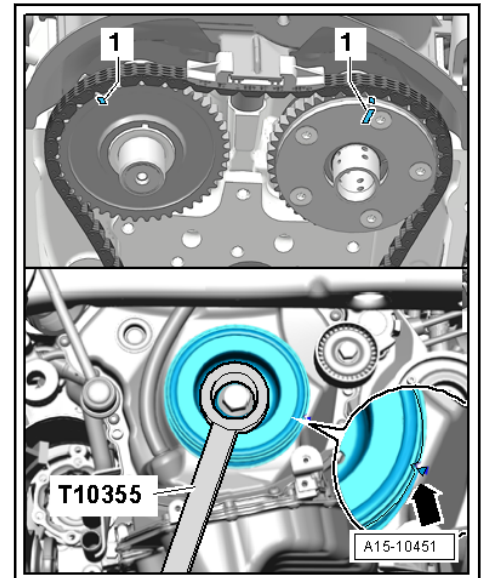
#### Tightening Specification

- ◆ Refer to ➤ [-2.1 Timing Chain Cover”, page 114](#)
- ◆ Refer to ➤ [-3.1 Camshaft Timing Chains”, page 125](#)
- ◆ Refer to ➤ [-3.2 Balance Shaft Drive Chain”, page 127](#)



### 3.7 Valve Timing, Checking

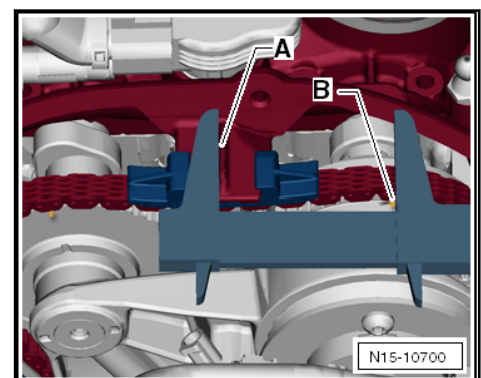
- Remove the upper timing chain cover. Refer to ➔ [T2.2 Timing Chain Cover, Removing and Installing](#), page 117.
- Remove the noise insulation. Refer to ➔ Body Exterior; Rep. Gr. 50; Noise Insulation.
- Disconnect the right charge air hose at the coupling.
- Turn the vibration damper from underneath in the direction of engine rotation to "TDC" -arrow-.



#### Note

*Use a ratchet with a 24 mm socket to turn the vibration damper. Always turn the vibration damper to "TDC" in the direction of engine rotation. Do not turn the vibration damper backward to get to TDC!*

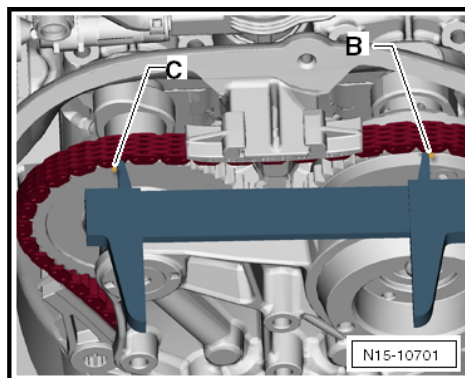
- The notch on the vibration damper must line up with the arrow marking on the timing chain lower cover (use a mirror).
- The markings -1- on the camshafts must point upward.
- Measure the distance from the outer edge -A- to the marking -B- on the intake camshaft.



- Specified value: 61 to 64 mm.



- Once the specified value is reached, measure the distance between the marking on the intake camshaft -B- and the marking on the exhaust camshaft -C-.



- Specified value: 124 to 126 mm.



**Note**

*If one tooth has an offset, there will be a deviation of approximately 6 mm from the specified value. If there is an offset, the timing chain must be refitted.*



## 4 Valvetrain

⇒ [4.1 Valvetrain", page 157](#)

⇒ [M4.2 easuring Axial Clearance", page 159](#)

⇒ [R4.3 emoving and Installing", page 160](#)

⇒ [C4.4 amshaft Adjustment Valve 1 N205, Removing and Installing", page 169](#)

⇒ [S4.5 tem Seals, Removing and Installing", page 170](#)

### 4.1 Overview - Valvetrain



## 1 - Exhaust Valve

- ☐ Do not rework, only lap-ping is permitted
- ☐ Valve dimensions. Refer to ➤ [D5.1 imen-sions", page 176](#) .
- ☐ Valve guides, checking. Refer to ➤ [G5.2 uides, Checking", page 176](#) .

## 2 - Cylinder Head

## 3 - Valve Guide

- ☐ Checking. Refer to ➤ [G5.2 uides, Checking", page 176](#) .

## 4 - Valve Stem Seal

- ☐ Replacing. Refer to ➤ [S4.5 tem Seals, Re-moving and Installing", page 170](#) .

## 5 - Valve Spring

## 6 - Valve Spring Retainer

## 7 - Cone Piece

## 8 - Hydraulic Lifter

- ☐ Do not interchange
- ☐ Lubricate contact surfaces

## 9 - Exhaust Camshaft

- ☐ Removing and installing. Refer to ➤ [R4.3 emoving and In-stalling", page 160](#) .
- ☐ Axial play, checking. Refer to ➤ [M4.2 easuring Axial Clearance", page 159](#) .
- ☐ Check radial clearance using Plastigage® (roller rocker lever removed)
- ☐ Radial clearance with 24 mm bearing diameter: 0.024 to 0.066 mm
- ☐ Radial clearance on 32 mm bearing diameter: 0.030 to 0.051 mm
- ☐ Run-out: maximum 0.04 mm

## 10 - Cylinder Head Cover

- ☐ With integrated camshaft bearings
- ☐ Clean sealing surface, reworking is not permitted.
- ☐ Remove old sealant residue.

## 11 - Bolt

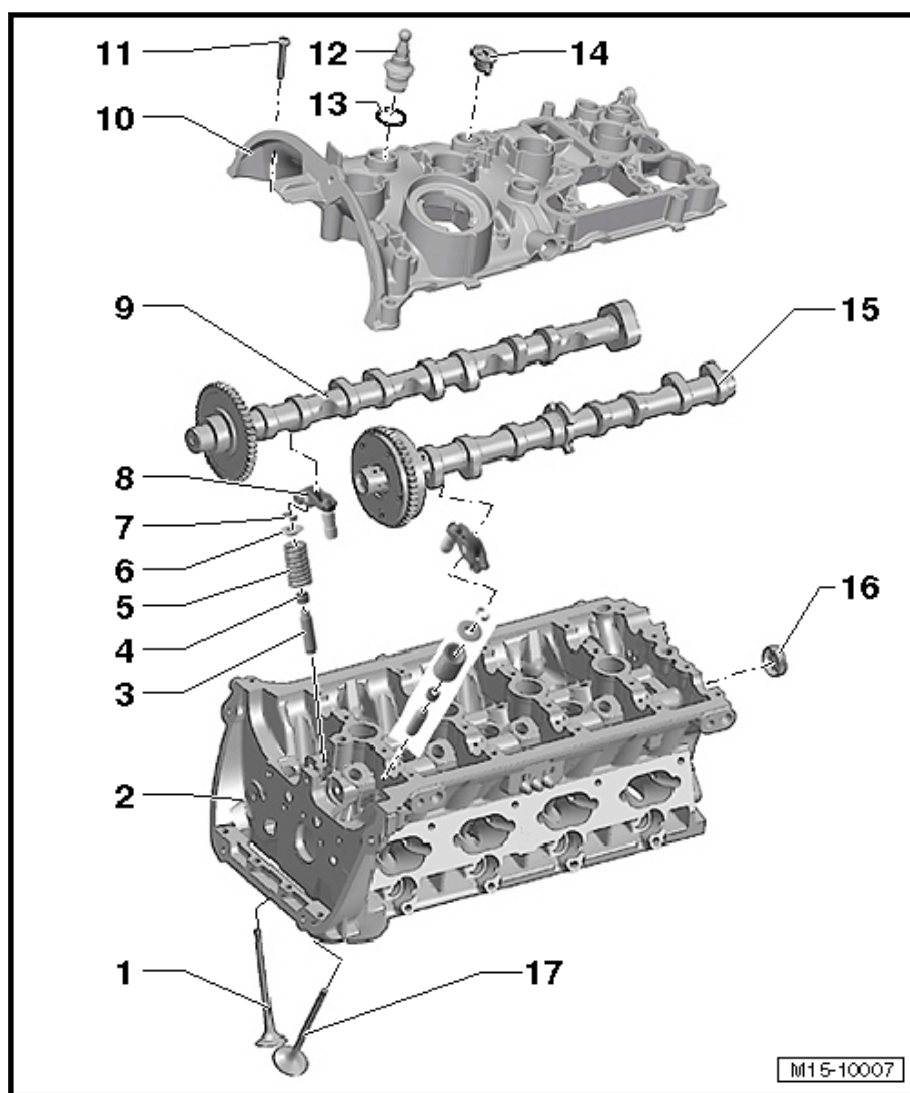
- ☐ Replace after removing
- ☐ Tightening sequence and specification. Refer to ➤ [Fig. "Cylinder Head Cover, Tightening Sequence and Tightening Specification", page 159](#) .

## 12 - Plugs

- ☐ 5 Nm
- ☐ With ball head for the engine cover

## 13 - O-Ring

- ☐ Replace after removing
- ☐ Lubricate with engine oil







#### 14 - Plug with O-Ring

- ☐ Replace after removing
- ☐ Coat the O-ring with engine oil

#### 15 - Intake Camshaft

- ☐ Removing and installing. Refer to [⇒ R4.3 removing and Installing", page 160](#) .
- ☐ Axial play, checking. Refer to [⇒ M4.2 measuring Axial Clearance", page 159](#) .
- ☐ Check radial clearance using Plastigage® (roller rocker lever removed)
- ☐ Radial clearance with 24 mm bearing diameter: 0.024 to 0.066 mm
- ☐ Run-out: maximum 0.04 mm

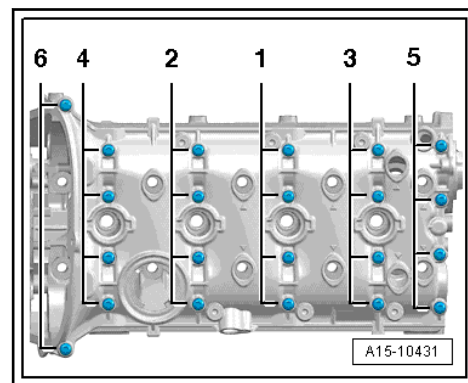
#### 16 - Cap

- ☐ Replace after removing
- ☐ Removing: with the cylinder head cover installed, pierce through one side of the cover with an awl and pry it out
- ☐ Installing: without sealant, press in 1 to 2 mm using the Seal Installer - Selector Shaft Oil Seal -T10174-

#### 17 - Intake Valve

- ☐ Do not rework, only lapping is permitted
- ☐ Valve dimensions. Refer to [⇒ D5.1 dimensions", page 176](#) .
- ☐ Valve guides, checking. Refer to [⇒ G5.2 guides, Checking", page 176](#) .

### Cylinder Head Cover, Tightening Sequence and Tightening Specification



- Tighten the new cylinder head cover bolts in sequence -1 to 6- as follows:

| Step | Bolts          | Tightening Specification/Additional Turn |
|------|----------------|--|
| 1    | -1 through 10- | Tighten hand-tight                       |
| 2    | -1 through 10- | 8 Nm                                     |
| 3    | -1 through 10- | 90° additional turn                      |



#### Note

*Make sure that the guide frame is not tilted.*

## 4.2 Camshaft, Measuring Axial Clearance

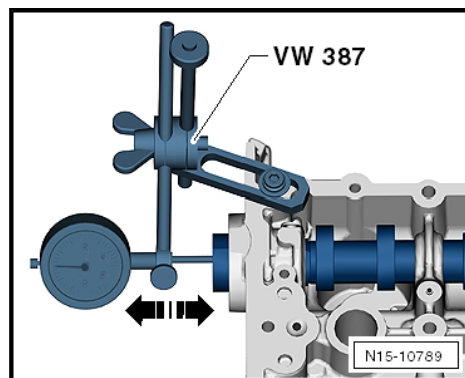
### Special tools and workshop equipment required

- ◆ Dial Gauge Holder -VW387-



- ◆ Dial Gauge - 0-10mm -VAS6079-

### Test Sequence



- Test with the guide frame removed.
- Place camshaft to be checked in guide frame.
- Secure the Dial Gauge - 0-10mm -VAS6079- with the Dial Gauge Holder -VW387- on the cylinder head.
- Press the camshaft against the Dial Gauge - 0-10mm - VAS6079- by hand.
- Set the Dial Gauge - 0-10mm -VAS6079- to "0".
- Push the camshaft off the Dial Gauge - 0-10mm -VAS6079- and read the value:
- Axial play: 0.05 to 0.17 mm.

## 4.3 Camshaft, Removing and Installing

### Special tools and workshop equipment required

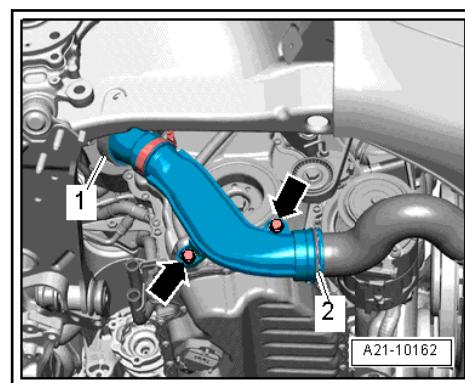
- ◆ Seal Installer - Selector Shaft Oil Seal -T10174-
- ◆ Central Valve Assembly Tool -T10352- (Engine code CCZA: Central Valve Assembly Tool -T10352/1-)
- ◆ Counterhold - Vibration Damper -T10355-
- ◆ Locking Pin (3 pc.) -T40011-
- ◆ Puller - Ignition Coil -T40039-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Silicone Sealant
- ◆ Cable Tie
- ◆ Flat-Blade Scraper
- ◆ Hand Drill with Plastic Brush Attachment
- ◆ Protective Eyewear

**Note**

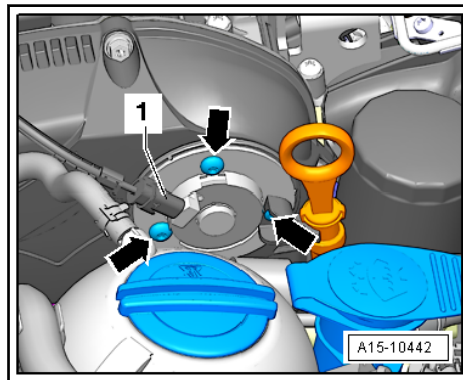
- ◆ *The cylinder head and the cylinder head cover must be replaced together.*
- ◆ *Do not start the engine for approximately 30 minutes after installing the camshafts. The hydraulic lifters must seat themselves (otherwise the valves will crash into the pistons).*
- ◆ *After working on the valvetrain and engine, carefully rotate by hand at least two full turns to be sure that valves do not strike pistons when starting.*
- ◆ *Always replace gaskets and seals.*

**Removing****Note**

- ◆ *The sealing surfaces of the lower cylinder head cover and on the upper cylinder head must not be reworked.*
- ◆ *The camshaft bearings are integrated in the cylinder head or cylinder head cover. Before removing the cylinder head cover, release the tension on the camshaft timing chain.*
- ◆ *If the cylinder head cover was removed, the cap must be replaced.*
- ◆ *All cable ties that are loosened or cut open during removal must be replaced in the same position during installation.*
- Remove the engine cover. Refer to ⇒ [C3.1 over, Removing and Installing](#), page 37 .
- Remove the vacuum pump. Refer to ⇒ [P1.3 ump, Removing and Installing](#), page 111 .
- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50; Noise Insulation.
- Remove the right front wheel.
- Remove the front section of the wheel housing liner or remove the front wheel housing liner. Refer to ⇒ Body Exterior; Rep. Gr. 66; Wheel Housing Liner; Front Wheel Housing Liner, Removing and Installing.
- Remove the bolts -arrows-.



- Remove the air duct pipe by lifting the clamps -1 and 2-.
- Disconnect the connector from the Camshaft Adjustment Valve 1 -N205- -1-.



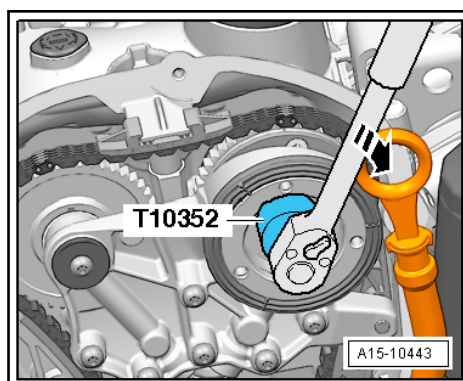
- Remove the bolts -arrows- and then remove the Camshaft Adjustment Valve 1 -N205-.
- Remove the upper timing chain cover. Refer to ➤ [T2.2 Timing Chain Cover, Removing and Installing](#), page 117.



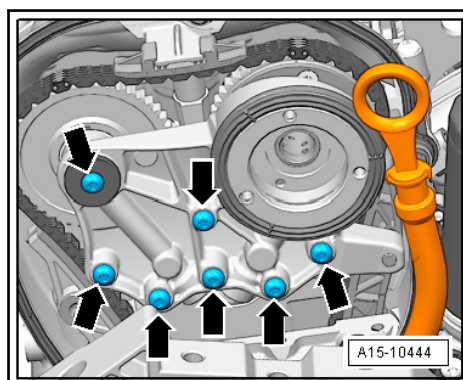
**Note**

*The control valve has left-hand thread.*

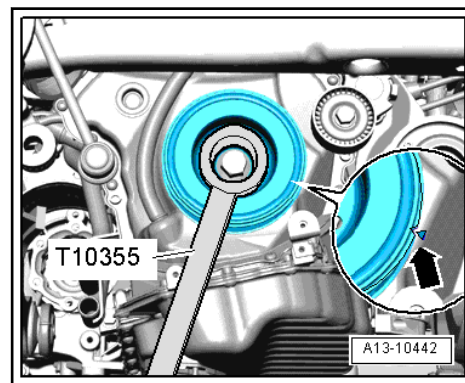
- Remove the control valve in the direction of -arrow- using the Central Valve Assembly Tool -T10352-.



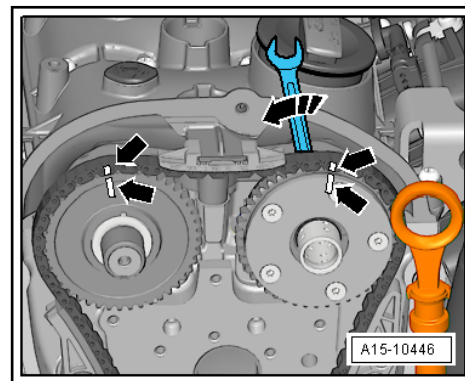
- Remove the bolts -arrows- and remove the bearing bracket.



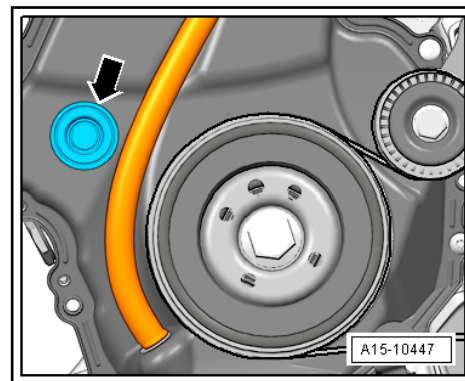
- Rotate the vibration damper using the Counterhold - Vibration Damper -T10355- into the “TDC” position -arrow-.



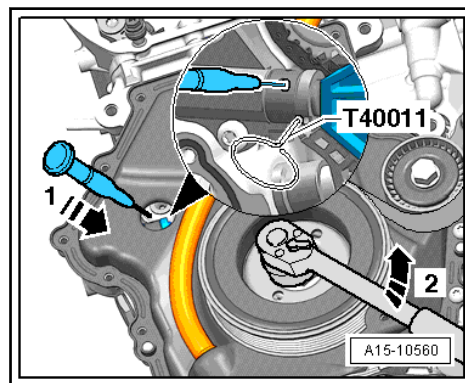
- The notch on the vibration damper must align with the arrow marking on the lower timing chain cover.
- Carefully mark the drive chain/chain sprockets -arrows- with a waterproof marker. These marks are necessary for reinstallation.



- Remove the plug -arrow-.



- Lift the chain tensioner locking wedge by inserting a scribe or a suitable screwdriver into the hole in the chain tensioner in the direction of -arrow 1-.



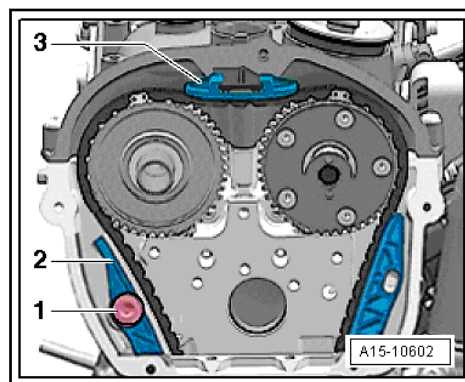
- Turn the crankshaft in the opposite direction of engine rotation in the direction of -arrow 2- and secure it with Locking Pin (3 pc.) -T40011-.



#### Note

*The intake camshaft switches in the engine direction of rotation.*

- Remove the bolt -1- and guide the tensioning rail -2- downward.



- Remove the upper glide rail -3-. Do this by releasing the retainer with a screwdriver and push the glide rail forward.



#### Note

*When the lower timing chain cover is installed, the loose chain on the crankshaft can »not« jump off.*

- Remove camshaft timing chain from chain sprockets.



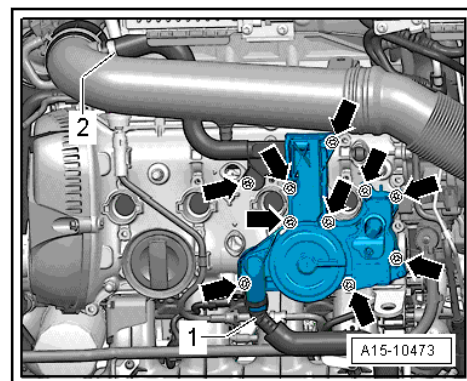
#### Note

- ♦ *If the camshaft timing chain was removed from the cylinder head, then the crankshaft may not be turned farther.*
- ♦ *Panels are installed on the lower timing chain cover to prevent the chain from falling down. If the crankshaft is rotated on a loose chain, the panels can bend.*
- Remove the Ignition Coils with Power Output Stages (refer to ⇒ [C1.3 oils with Power Output Stages, Removing and Installing](#), page 371 ) and free up the wiring harness.

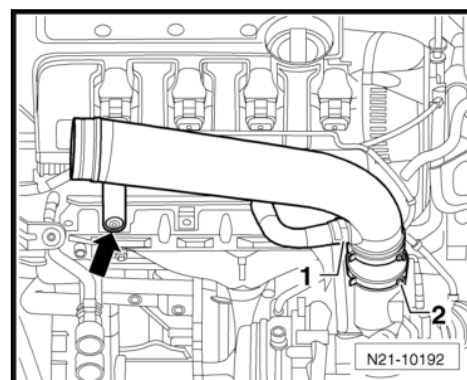




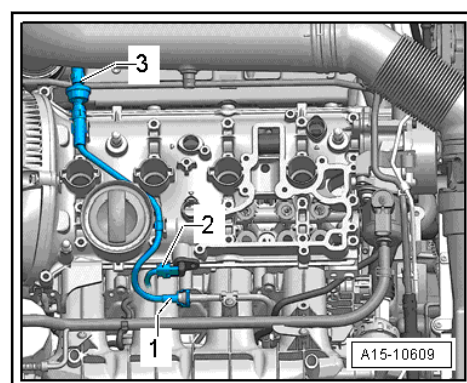
- Disconnect the crankcase ventilation hose -1-.



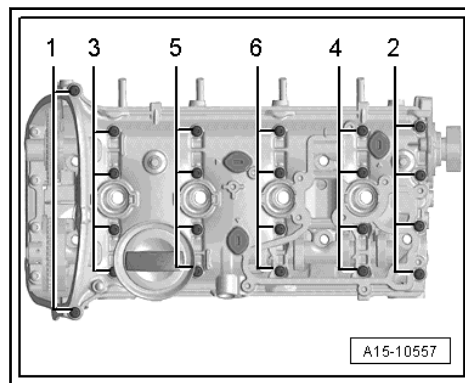
- Remove the bolts -arrows-.
- Remove the air duct pipe bolt -arrow-.



- Loosen the hose clamp -2- and remove the air duct pipe together with the crankcase ventilation.
- Disconnect the vacuum line -1- and free up the line.



- Remove the connector from the Camshaft Position Sensor -G40- -2-.
- Remove the cylinder head cover bolts in -1 to 6- sequence.



- Remove the cylinder head cover.
- Remove camshafts.
- Prevent dirt and sealant residue from entering the cylinder head.

### Installing



#### Note

- ◆ *Sealing surfaces must be completely free of oil and grease.*
- ◆ *The pistons must not be positioned at TDC.*
- ◆ *Pay attention that all roller rocker levers rest on the valve stem ends.*
- ◆ *Check the expiration date of the Silicone Sealant.*
- ◆ *The cylinder head cover must be installed within 5 minutes after applying the silicone sealant.*
- Remove any sealant residue on the cylinder head using the flat-blade scraper.



#### WARNING

**Risk of injuring the eyes from sealant residue.**

- **Wear protective eyewear.**

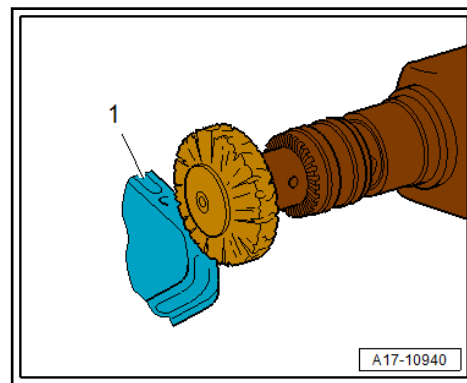


#### Note

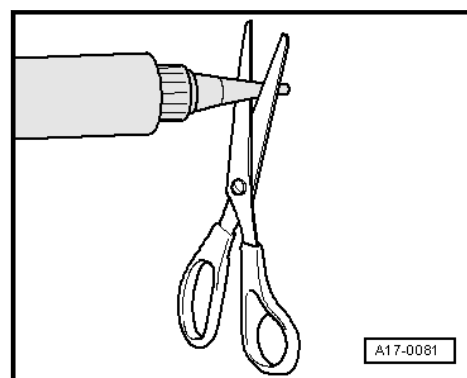
*Prevent dirt and sealant residue from entering the cylinder head.*

- Remove any sealant residue of the groove in the cylinder head cover as well as from any sealing surface using, for example, a rotating plastic brush.

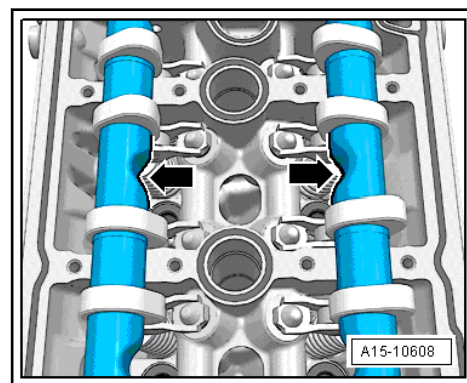




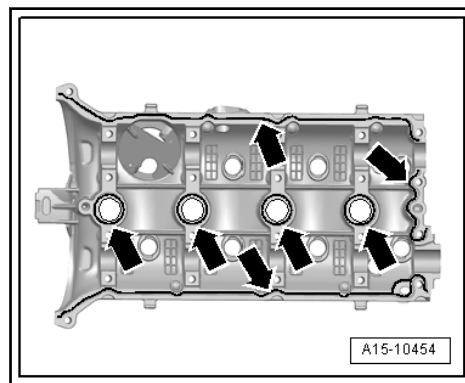
- Sealing surfaces must be free of oil and grease.
- Cut the tube nozzle at the front marking (nozzle diameter: approximately 2 mm).



- Lubricate the running surfaces of both camshafts.
- Place the camshaft into the cylinder head; the recesses -arrows- must be perpendicular to each other.



- Replace the cylinder head cover bolts.
- Apply the Silicone Sealant on the clean sealing surface of the cylinder head cover as shown -arrows-.



- Sealant bead thickness: 2 to 3 mm.



**Note**

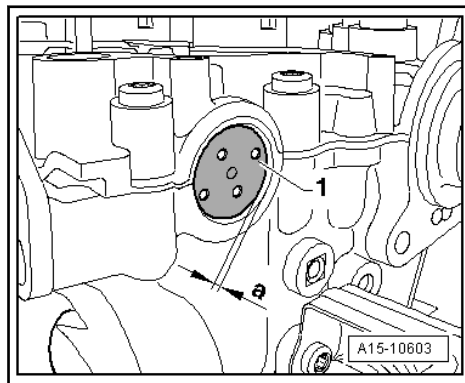
- ◆ *The cylinder head cover must be installed within five minutes after application of Silicone Sealant.*
- ◆ *The sealant bead may not be thicker than specified, otherwise excess sealant could enter the oil pan and clog the oil intake pipe screen.*
- ◆ *Be sure to check the expiration date of the sealant.*
- Tighten the bolts in multiple steps. Refer to ➤ [Fig. “Cylinder Head Cover, Tightening Sequence and Tightening Specification”, page 159](#).



**Note**

*Pay attention that the cylinder head cover is not tilted.*

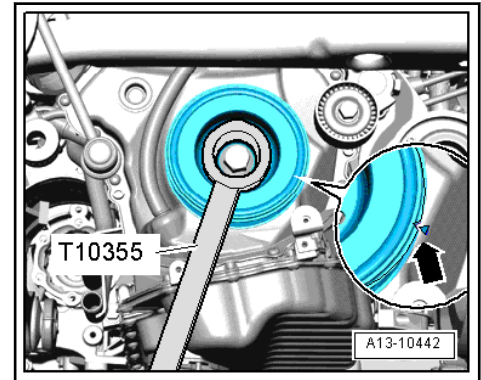
- Insert the cap -1- without sealant using the Seal Installer - Selector Shaft Oil Seal -T10174-.



- Dimension -a-: 1 to 2 mm

When rotating the crankshaft, make sure the timing chain cannot damage any other components.

- Turn the vibration damper into “TDC” -arrow- using the Counterhold - Vibration Damper -T10355A-.

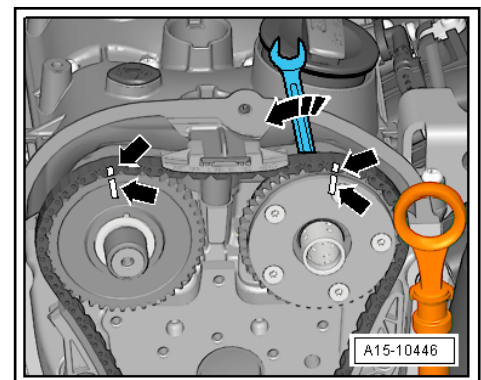


- The notch on the vibration damper must align with the arrow marking on the lower timing chain cover.

### Note

*The marked chain links for the timing chain must be positioned at the markings on the chain sprockets.*

- Mount the camshaft timing chain:



- The markings drive chain/chain sprockets -arrows- must align.
- Turn the intake camshaft using the wrench in the direction of -arrow- and mount the timing chain.

Further assembly is performed in the reverse order of the removal.

### Tightening Specification

- ◆ Refer to [⇒ -2.2 Charge Air System”, page 283](#)
- ◆ Refer to [⇒ -2.1 Timing Chain Cover”, page 114](#)
- ◆ Refer to [⇒ -4.1 Valvetrain”, page 157](#)
- ◆ Refer to [⇒ -3.1 Camshaft Timing Chains”, page 125](#)
- ◆ Refer to [⇒ Fig. “Crankcase Ventilation, Tightening Sequence and Tightening Specification”, page 91](#)

## 4.4 Camshaft Adjustment Valve 1 -N205-, Removing and Installing

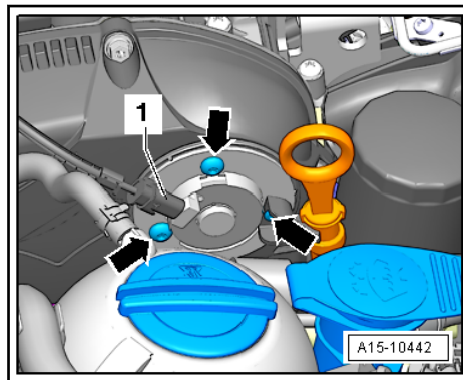
### Special tools and workshop equipment required

- ◆ Torque Wrench 1783 - 2-10Nm -VAG1783-
- ◆ Torque Wrench 1783 - Open Jaw - 10mm -VAG1783/1-



## Removing

- If equipped, remove the charge air guide to the sound generator.
- Disconnect the connector from the Camshaft Adjustment Valve 1 -N205- -1-.



- Remove the bolts -arrows- and then remove the Camshaft Adjustment Valve 1 -N205-.

## Installing

Install in reverse order of removal. Note the following:

- Coat the seal and the O-ring with engine oil.

## Tightening Specification

- ◆ Refer to ➔ [-2.1 Timing Chain Cover-, page 114](#)

## 4.5 Valve Stem Seals, Removing and Installing

### Special tools and workshop equipment required

- ◆ Spark Plug Removal Tool -3122B-
- ◆ Puller - Valve Seal -3364-
- ◆ Seal Installer - Valve Stem -3365-
- ◆ Valve Cotter Tool Kit - Adapter -T40012-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Valve Cotter Tool Kit -VAS5161A-.
- ◆ Valve Cotter Tool Kit - Guide Plate 19c -VAS5161/19C-



### Note

- ◆ *The cylinder head and the cylinder head cover must be replaced together.*
- ◆ *Do not start the engine for approximately 30 minutes after installing the camshafts. The hydraulic lifters must seat themselves (otherwise the valves will crash into the pistons).*
- ◆ *After working on the valvetrain and engine, carefully rotate by hand at least two full turns to be sure that valves do not strike pistons when starting.*
- ◆ *Always replace gaskets and seals.*



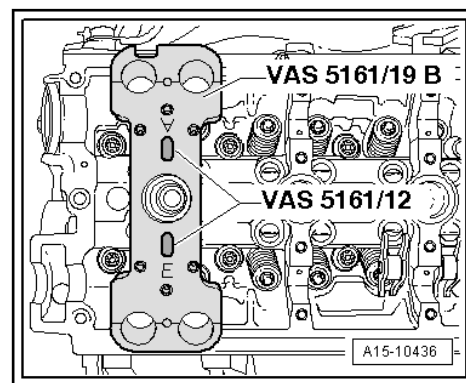
## Removing



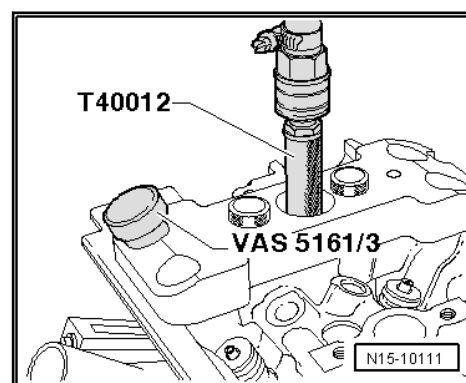
### Note

*Valve Cotter Tool Kit - Guide Plate 19B -VAS5161/19B- is superseded by Valve Cotter Tool Kit - Guide Plate 19c - VAS5161/19C-*

- Remove the camshafts. Refer to [⇒ R4.3 removing and Installing”, page 160](#) .
- Remove the roller rocker lever and place it on a clean surface. While doing this, make sure that roller rocker levers are not interchanged.
- Remove the Spark Plugs using the Spark Plug Removal Tool -3122B-.
- Install the Valve Cotter Tool Kit - Guide Plate 19c - VAS5161/19C- with the Valve Cotter Tool Kit Knurled Thumb Screws M6 -VAS5161/12- as shown on the cylinder head.



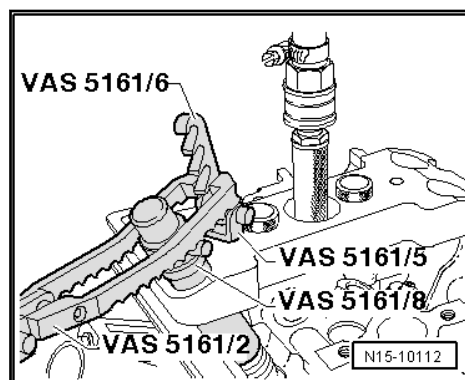
- Set the piston for the respective cylinder to the “bottom dead center (BDC)” position.
- Install the Valve Cotter Tool Kit - Adapter -T40012- in the spark plug thread. Connect compressed air with at least 6 bar (87.02 psi) pressure.



- Loosen the securely fitted valve retainers using a Valve Cotter Tool Update Kit - Punch -VAS5161/3A- and a plastic hammer.

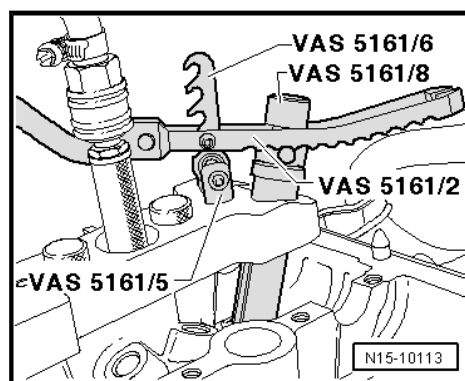


## Intake Side

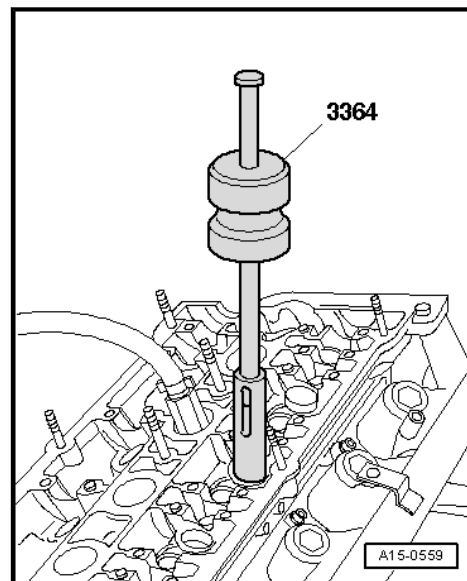


- Install the Valve Cotter Tool Kit - Retainer -VAS5161/6- with Valve Cotter Tool Kit - Guide Forks M6/M8 Threaded -VAS5161/5- in the center thread of the Valve Cotter Tool Kit - Guide Plate 19c -VAS5161/19C-.
- Place the Valve Cotter Tool Kit - Assembly Cartridge - VAS5161/8A- in the Valve Cotter Tool Kit - Guide Plate 19c -VAS5161/19C-.
- Engage the Valve Cotter Tool Kit - Pressure Fork with Lever for Assembly Cartridge -VAS5161/2- on the Valve Cotter Tool Kit - Retainer -VAS5161/6-.

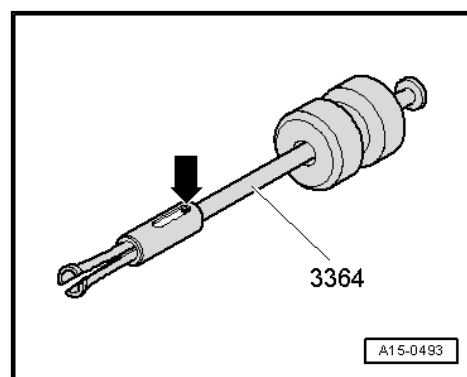
## Exhaust Side



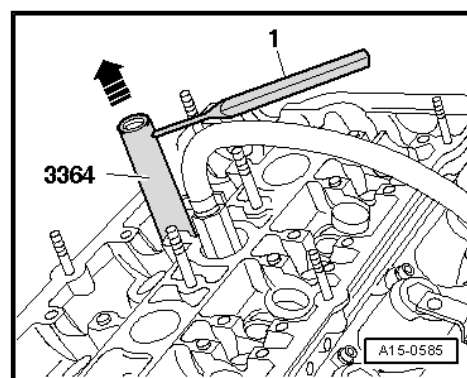
- Install the Valve Cotter Tool Kit - Retainer -VAS5161/6- with Valve Cotter Tool Kit - Guide Forks M6/M8 with Threaded Studs -VAS5161/5- in the outer thread of the Valve Cotter Tool Kit - Guide Plate 19c -VAS5161/19C-.
- Press down the Valve Cotter Tool Kit - Assembly Cartridge -VAS5161/8A-. At the same time, turn the knurled screw of the Valve Cotter Tool Kit - Assembly Cartridge -VAS5161/8A- to the right until the points engage in the valve retainers.
- Lightly move knurled bolt back and forth, causing the valve retainers to push apart and engage in the assembly cartridge.
- Release the Pressure Fork With Lever For Assembly Cartridge -VAS5161/2-.
- Remove the Valve Cotter Tool Kit - Assembly Cartridge -VAS5161/8A-.
- Remove the valve stem seals using Puller - Valve Seal -3364-.



- If the Puller - Valve Seal -3364- cannot be used because there is not enough space, drive the spring pin -arrow- out using a drift and remove the impact attachment.



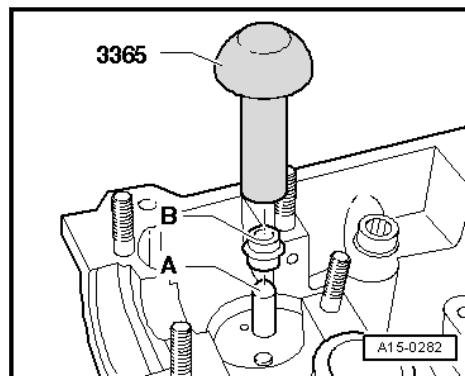
- Position the lower section of the Puller - Valve Seal -3364- on the valve stem seal.



- Place a drift -1- in the hole in the lower section of the removal tool.
- Position an extractor lever on the puller tool and remove the valve stem seal in direction of -arrow-.

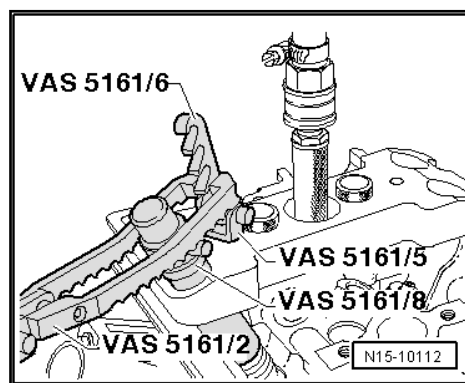
#### Installing

- Place plastic sleeve -A- on the valve stem to prevent damage to the new valve stem seals -B-.



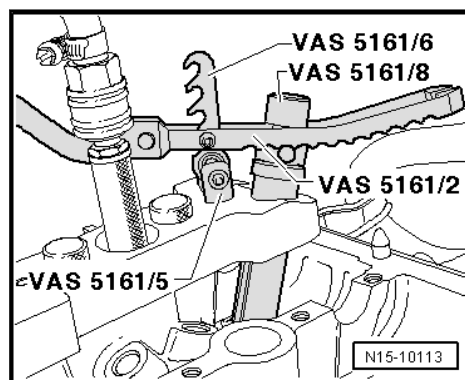
- Oil the sealing lip of valve stem seal -B-, insert into Seal Installer - Valve Stem -3365- and carefully slide onto the valve guide.
- Remove the plastic sleeve -A-.
- Insert the valve spring and valve spring retainer.

#### Intake Side



- Install the Valve Cotter Tool Kit -VAS5161A- as shown:

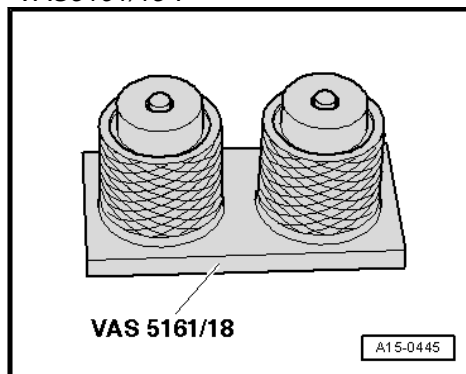
#### Exhaust Side





**Note**

*If the valve retainers were removed from the installation cartridge, they must then be inserted into the Valve Cotter Tool Kit - Valve Insertion Device -VAS5161/18-.*



*Press the Valve Cotter Tool Kit - Assembly Cartridge - VAS5161/8A- onto the insertion device from above and capture the valve retainers.*

- Press the Valve Cotter Tool Kit - Assembly Cartridge - VAS5161/8A- down with the Valve Cotter Tool Kit - Pressure Fork with Lever for Assembly Cartridge -VAS5161/2- and move the knurled bolt for the assembly cartridge back and forth while pulling up.
- Release the Pressure Fork with Lever for Assembly Cartridge -VAS5161/2- with the knurled thumb screw pulled.
- Remove the Valve Cotter Tool Kit -VAS5161A-.
- Install the Spark Plugs. Refer to [⇒ -1.1 Ignition System", page 368](#) .
- Install the Ignition Coils with Power Output Stages. Refer to [⇒ C1.3 oils with Power Output Stages, Removing and Installing", page 371](#) .

Further assembly is performed in the reverse order of the removal.

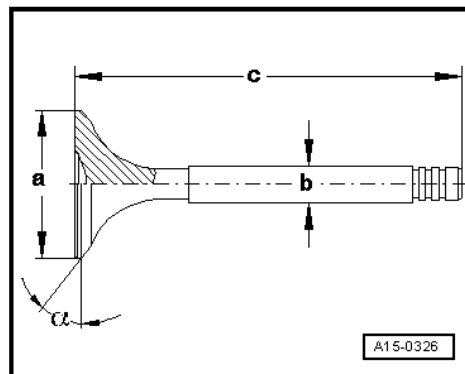


## 5 Intake and Exhaust Valves

⇒ [D5.1 imensions", page 176](#)

⇒ [G5.2 uides, Checking", page 176](#)

### 5.1 Valve Dimensions



#### Note

*Intake and exhaust valves must not be reworked. Only lapping is permitted.*

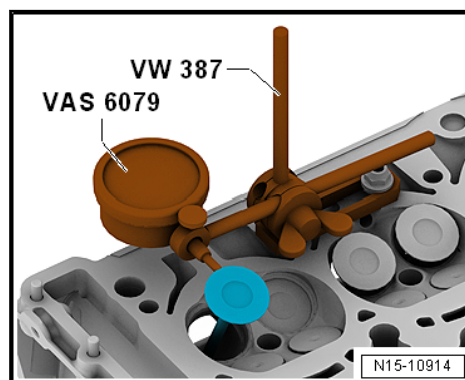
| Dimension  |    | Intake Valve      | Exhaust Valve     |
|------------|----|-------------------|-------------------|
| Diameter a | mm | $33.85 \pm 0.10$  | $28.00 \pm 0.1$   |
| Diameter b | mm | $5.980 \pm 0.007$ | $5.955 \pm 0.007$ |
| c          | mm | 103.97            | 101.87            |
| α          | °  | 45                | 45                |

### 5.2 Valve Guides, Checking

Special tools and workshop equipment required

- ◆ Dial Gauge Holder -VW387-
- ◆ Dial Gauge - 0-10mm -VAS6079-

#### Test Sequence



- Insert the valve into guide. The valve stem end must be flush with the guide. Use only the intake valve in the intake guide or the exhaust valve in the exhaust guide.
- Determine the tilting clearance.



- Intake and exhaust valve wear limit: 0.8 mm



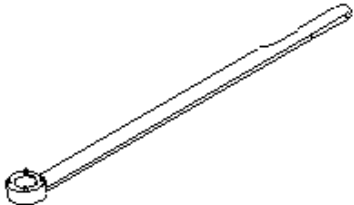
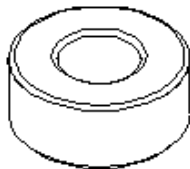

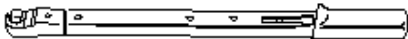
**Note**

- ◆ *If the wear limit is exceeded, measure using new valves.*
- ◆ *Replace the cylinder head if the wear limit is still exceeded.*
- ◆ *If the valve was replaced during a repair, a new valve must be used to measure.*

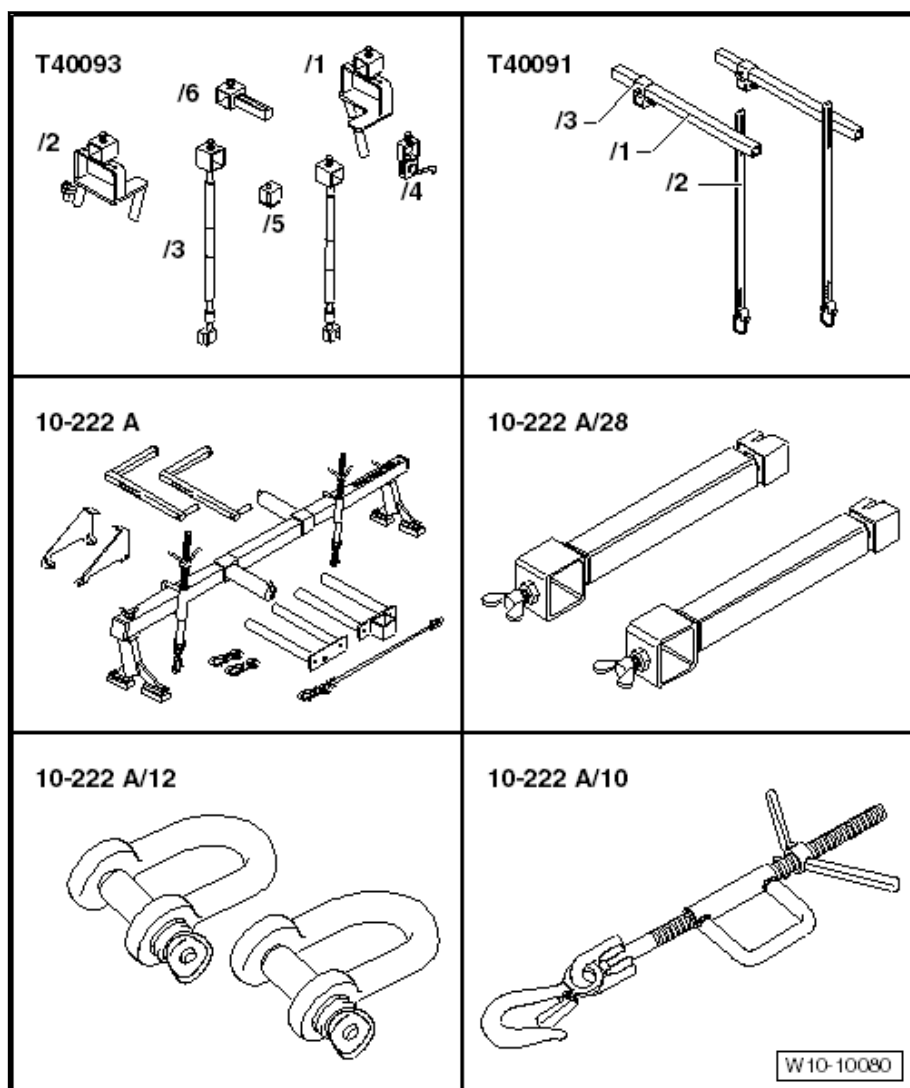


## 6 Special Tools

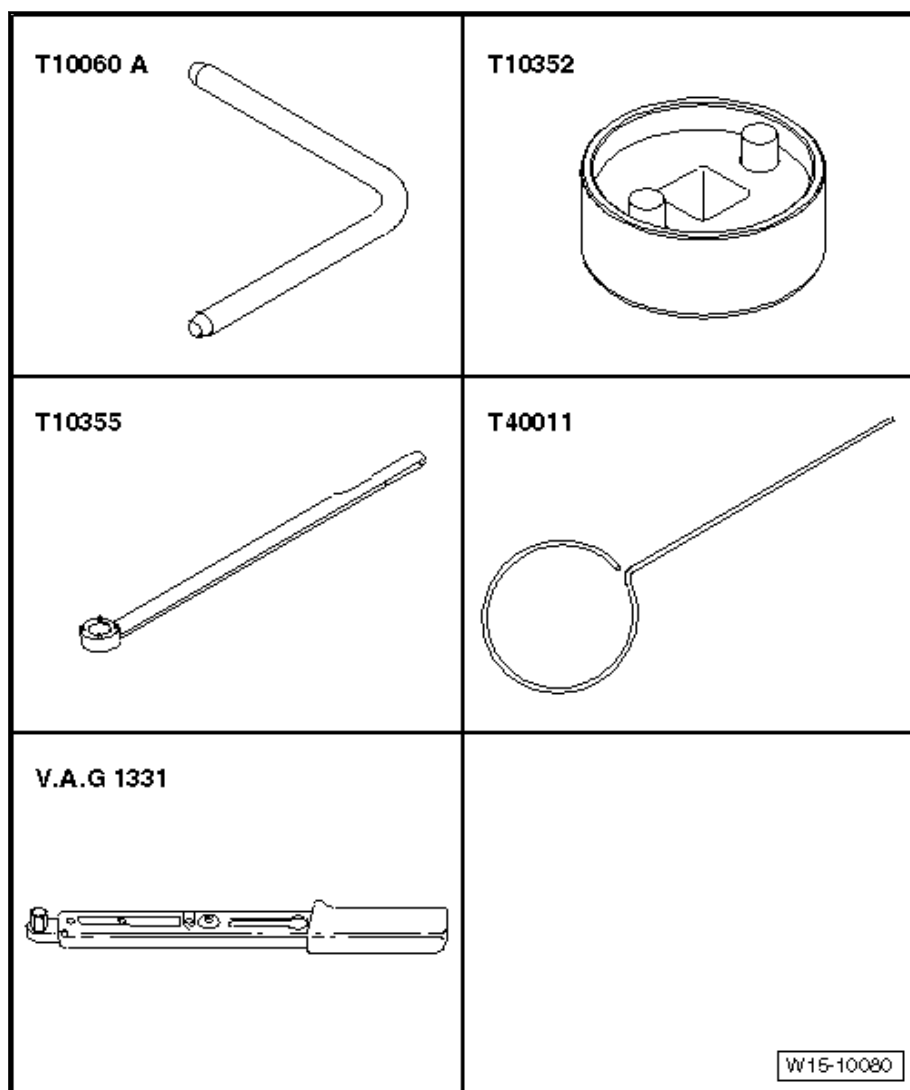
Special tools and workshop equipment required

|  |   |
|--|---|
| <b>T10355</b><br>     | <b>T10368</b><br>    |
| <b>V.A.G 1331</b><br> | <b>V.A.G 1332</b><br> |
|  | <div>W13-10026</div>  |

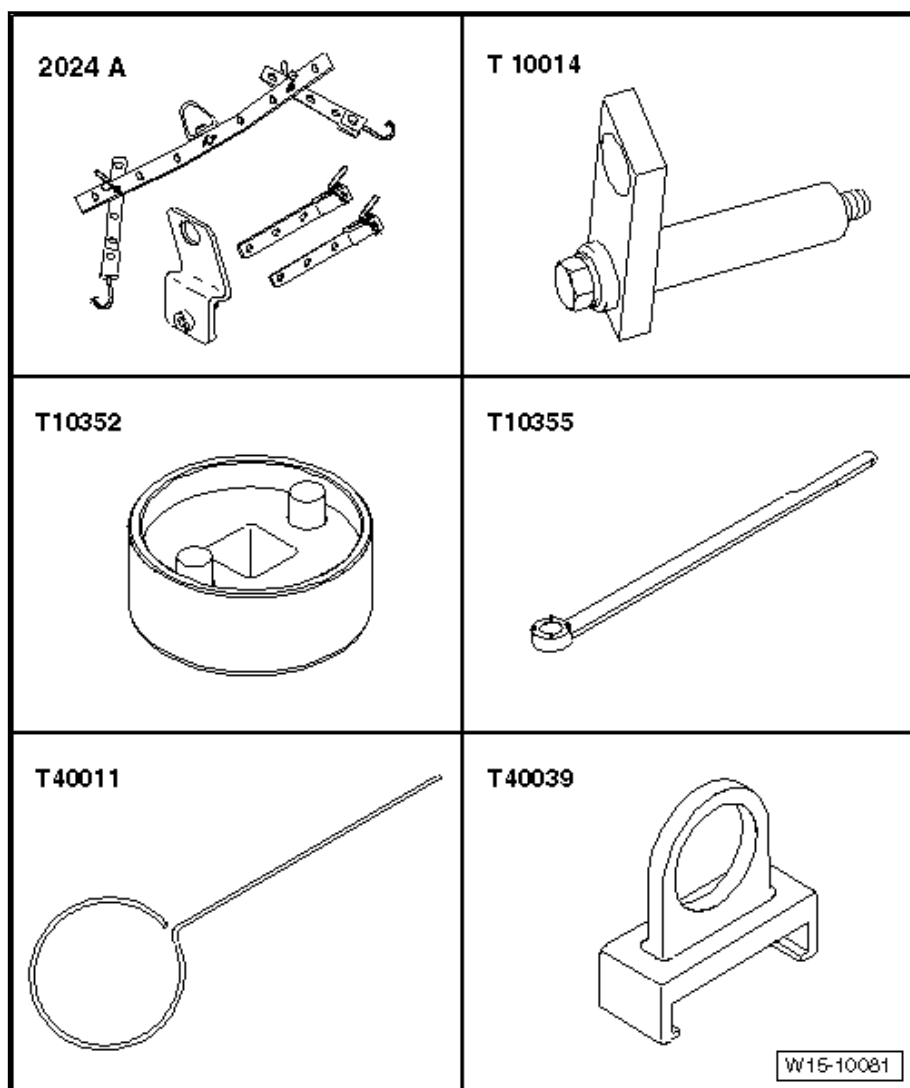
- ◆ Counterhold - Vibration Damper -T10355-
- ◆ Press Piece - Timing Chain Cover -T10368-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Torque Wrench 1332 40-200Nm -VAG1332-



- ◆ Engine Support Bridge -10-222A-
- ◆ Engine Support Bridge - Spindle -10-222A/11-
- ◆ Engine Support Bridge - Engine Support 28 -10-222A/28-
- ◆ Engine Support Bridge - Engine Support 31 -10-222A/31-
- ◆ Engine Support - Basic Set - Rail with Holes -T40091/2- from the Engine Support - Basic Set -T40091-
- ◆ Engine Support - Supplement Kit - Mount -T40093/5- from the Engine Support - Supplement Kit -T40093A-
- ◆ Engine Support Bridge - Engine Support 28-2 -10-222A/28-2-, quantity: 2
- ◆ Engine Support - Basic Set - Square Pipe -T40091/1- (quantity: 2) from the Engine Support - Basic Set -T40091-
- ◆ Engine Support - Basic Set - Movable Joint -T40091/3- (quantity: 2) from the Engine Support - Basic Set -T40091-
- ◆ Engine Support - Movable Joint -T40093/4- (quantity: 2) from the Engine Support - Supplement Kit -T40093A-

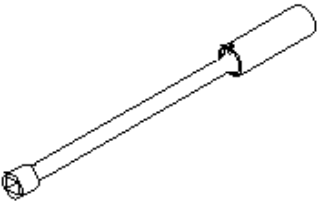
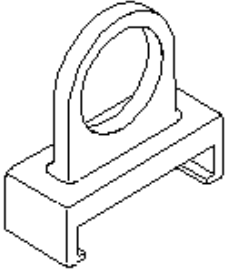
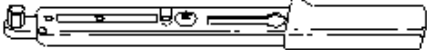



- ◆ Locking Pin -T10060A-
- ◆ Central Valve Assembly Tool -T10352- (Engine code CCZA:  
Central Valve Assembly Tool -T10352/1-)
- ◆ Counterhold - Vibration Damper -T10355-
- ◆ Locking Pin (3 pc.) -T40011-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-



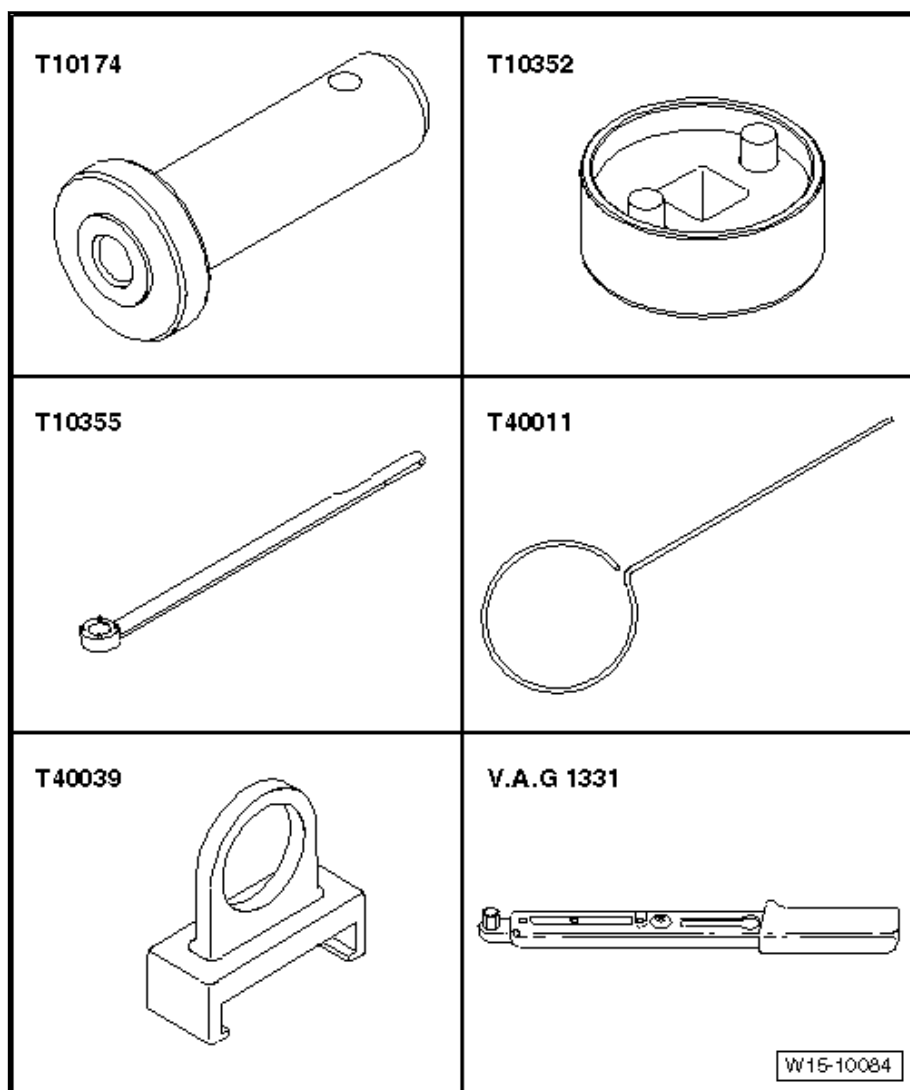
- ◆ Engine Sling -2024A-
- ◆ Engine Support -T10014-
- ◆ Central Valve Assembly Tool -T10352- (Engine code CCZA:  
Central Valve Assembly Tool -T10352/1-)
- ◆ Counterhold - Vibration Damper -T10355-
- ◆ Locking Pin (3 pc.) -T40011-
- ◆ Puller - Ignition Coil -T40039-



|  |  |
|--|--|
| <b>3122 B</b><br>     | <b>T40039</b><br>     |
| <b>V.A.G 1331</b><br> | <b>V.A.G 1763</b><br> |
|  | <div>W15-10083</div>   |

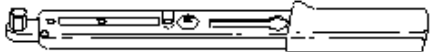
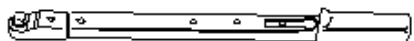
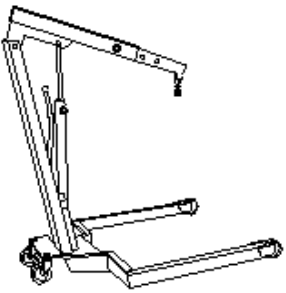

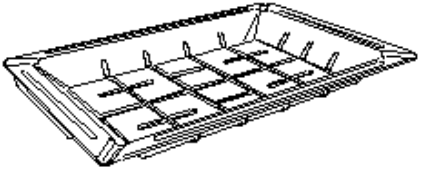
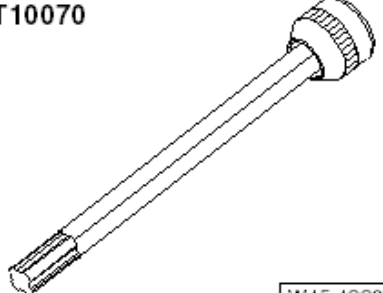
- ◆ Spark Plug Removal Tool -3122B-
- ◆ Puller - Ignition Coil -T40039-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Compression Tester Kit -VAG1763- with Compression Tester Kit - Adapter 6 -VAG1763/6-



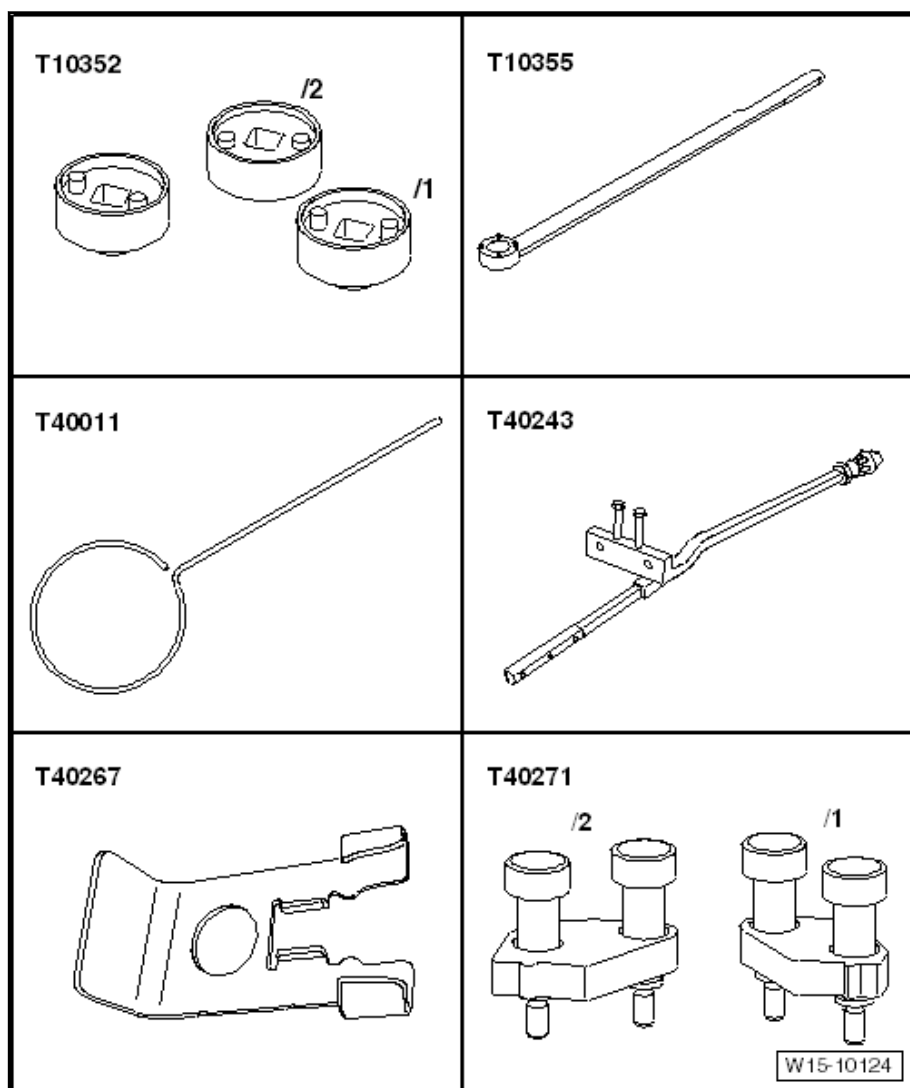


- ◆ Seal Installer - Selector Shaft Oil Seal -T10174-
- ◆ Central Valve Assembly Tool -T10352- (Engine code CCZA:  
Central Valve Assembly Tool -T10352/1-)
- ◆ Counterhold - Vibration Damper -T10355-
- ◆ Locking Pin (3 pc.) -T40011-
- ◆ Puller - Ignition Coil -T40039-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Silicone Sealant
- ◆ Cable Tie
- ◆ Flat-Blade Scraper
- ◆ Hand Drill with Plastic Brush Attachment
- ◆ Protective Eyewear



|  |  |
|--|--|
| <b>V.A.G 1331</b><br> | <b>V.A.G 1332</b><br>                        |
| <b>VAS 6100</b><br>   | <b>VAS 6122</b><br>                          |
| <b>VAS 6208</b><br> | <b>T10070</b><br><br><span>W15-10089</span> |

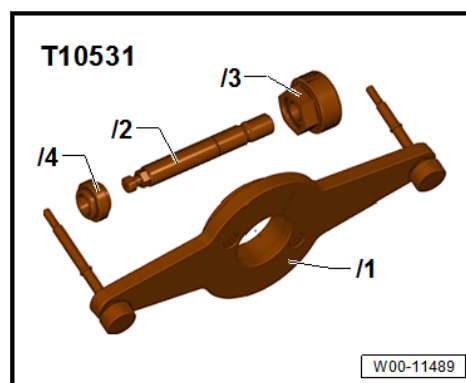
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Torque Wrench 1332 40-200Nm -VAG1332-
- ◆ Shop Crane -VAS6100-
- ◆ Engine Bung Set -VAS6122-
- ◆ Drip Tray for VAG1202A -VAG1306- or Shop Crane - Drip Tray -VAS6208-
- ◆ Polydrive Bit Drive Socket -T10070-



- ◆ Central Valve Assembly Tool -T10352-
- ◆ Central Valve Assembly Tool -T10352- (Engine code CCZA:  
Central Valve Assembly Tool -T10352/1-)
- ◆ Counterhold - Vibration Damper -T10355-
- ◆ Locking Pin (3 pc.) -T40011-
- ◆ Chain Tensioner Lever -T40243-
- ◆ Tensioner Locking Tool -T40267-
- ◆ Camshaft Locks -T40271-

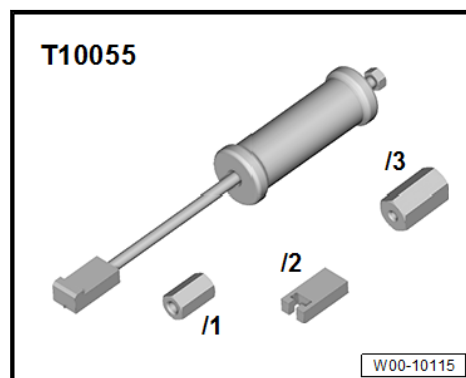


♦ Vibration Damper Assembly Tool -T10531-

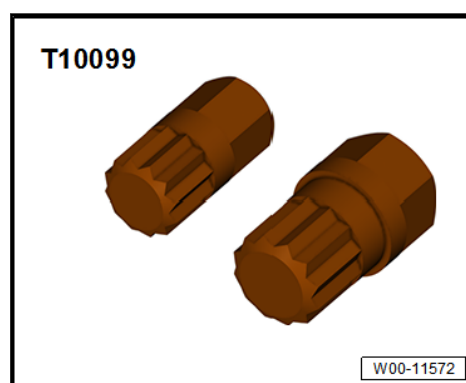


Individual components of the Vibration Damper Assembly Tool -T10531-:

- ♦ Vibration Damper Assembly Tool - Counterhold Tool - T10531/1-
- ♦ Vibration Damper Assembly Tool - Tensioning Pins - T10531/2-
- ♦ Vibration Damper Assembly Tool - Turning Over Tool - T10531/3-
- ♦ Vibration Damper Assembly Tool - Knurled Nut -T10531/4-
- ♦ Puller - Unit Injector -T10055-

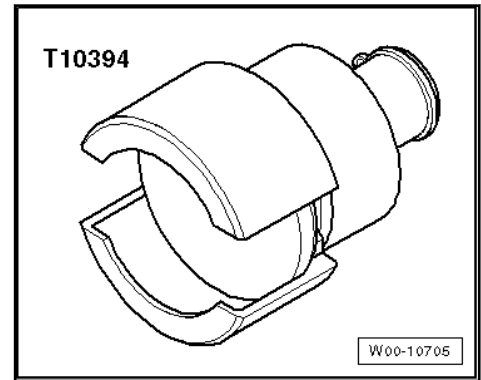


♦ Bits for VAG1331/13 -T10099-

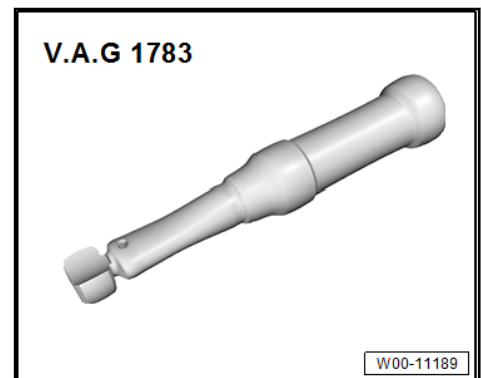




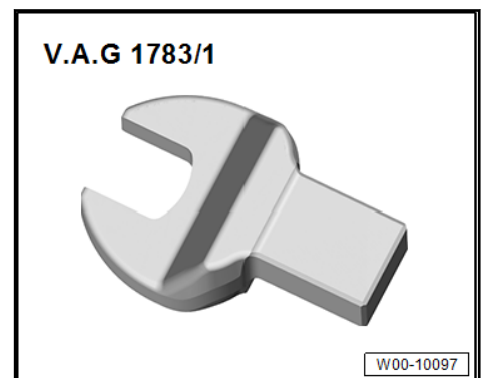
◆ Puller - Balancer Shaft -T10394-



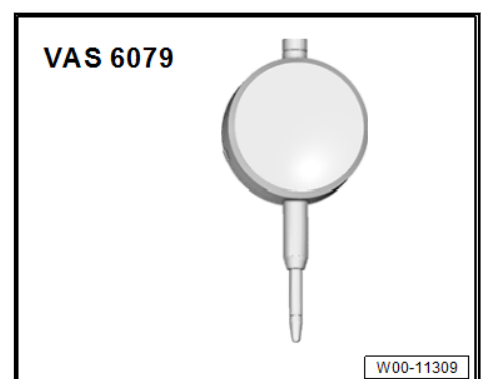
◆ Torque Wrench 1783 - 2-10Nm -VAG1783-



◆ Torque Wrench 1783 - Open Jaw - 10mm -VAG1783/1-



◆ Dial Gauge - 0-10mm -VAS6079-



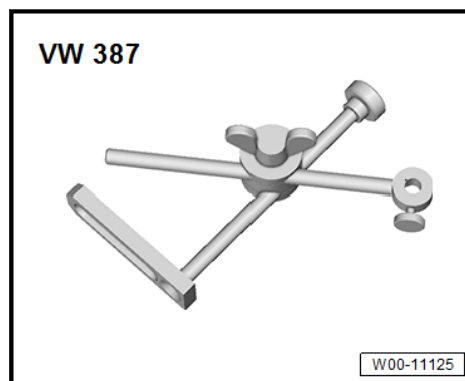


Jetta 2011 ➤

4-Cylinder Fuel Injection Engine (2.0L Engine, EA 888, Chain Drive) - Edition 11.2018

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◆ Dial Gauge Holder -VW387-





## 17 – Lubrication

### 1 Oil Pan/Oil Pump

⇒ [-1.1 Oil Pan/Oil Pump", page 189](#)

⇒ [O1.2 il", page 193](#)

⇒ [P1.3 an Lower Section, Removing and Installing", page 194](#)

⇒ [P1.4 an Upper Section, Removing and Installing", page 197](#)

⇒ [P1.5 ump, Removing and Installing", page 202](#)

#### 1.1 Overview - Oil Pan/Oil Pump



**1 - Oil Level Thermal Sensor -G266-**

- ☐ Engine codes CAWB and CCZA only

**2 - Seal**

- ☐ Replace after removing
- ☐ Engine codes CAWB and CCZA only

**3 - Bolt**

- ☐ Replace after removing
- ☐ Tightening sequence and specification. Refer to ➤ [Fig. "Lower Oil Pan Section, Tightening Sequence and Tightening Specification", page 191](#).

**4 - Oil Pan Lower Section**

- ☐ Removing and installing. Refer to ➤ [P1.3 and Lower Section, Removing and Installing", page 194](#).

**5 - Bolt**

- ☐ 9 Nm

**6 - Oil Baffle**

- ☐ Replace after removing

**7 - Oil Pump Bolts**

- ☐ M6: 9 Nm
- ☐ M8: 20 Nm

**8 - Oil Pump**

- ☐ Removing and installing. Refer to ➤ [P1.5 ump, Removing and Installing", page 202](#).
- ☐ Checking the oil pressure and Oil Pressure Switch -F1-. Refer to ➤ [P3.4 ressure and Oil Pressure Switch F1, Checking", page 211](#).

**9 - Alignment Sleeve**

- ☐ For centering the oil pump

**10 - Chain Tensioner**

- ☐ For the oil pump drive chain

**11 - Bolt**

- ☐ 9 Nm

**12 - Bolt**

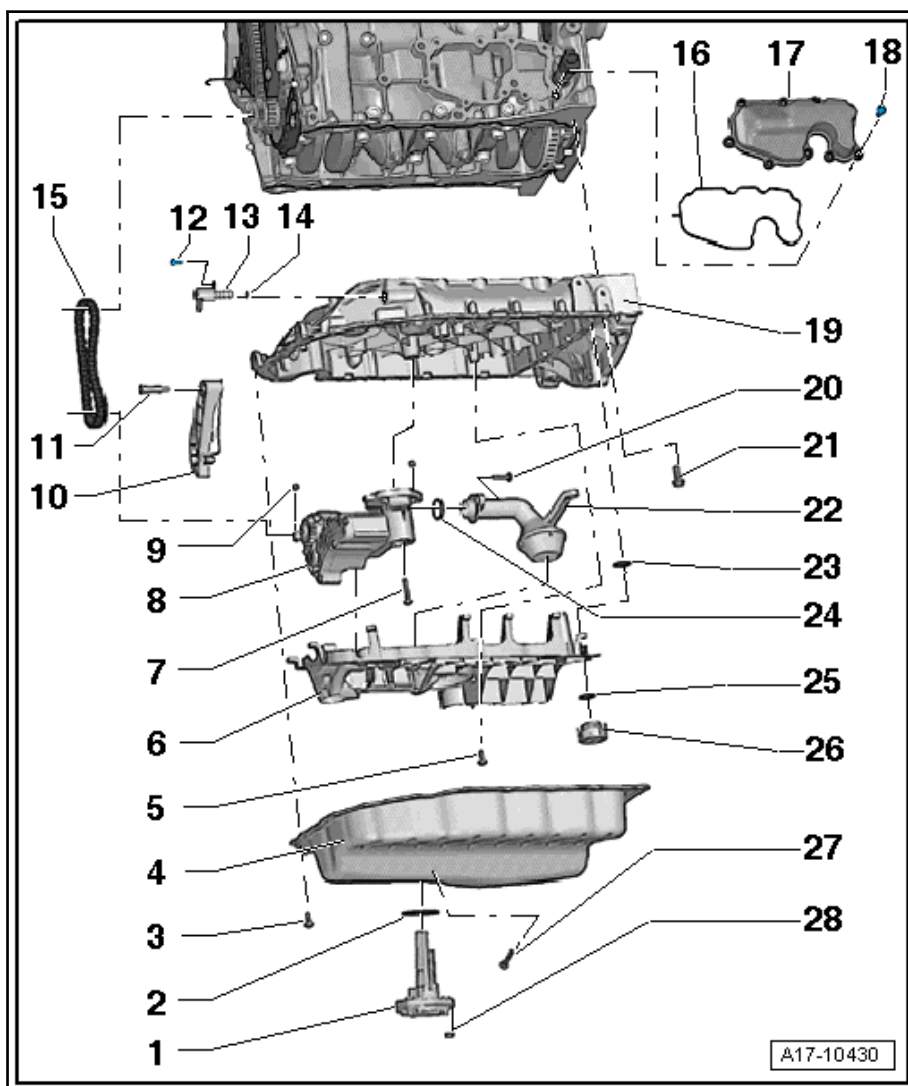
- ☐ 9 Nm
- ☐ Engine code CCZA only

**13 - Oil Pressure Regulation Valve -N428-**

- ☐ Engine code CCZA only
- ☐ Removing and installing. Refer to ➤ [O3.8 il Pressure Regulation Valve N428, Removing and Installing", page 218](#).

**14 - O-Ring**

- ☐ Replace after removing
- ☐ Engine code CCZA only





**15 - Drive Chain**

- ☐ For the oil pump
- ☐ Mark direction of rotation before removing

**16 - Seal**

- ☐ Replace after removing

**17 - Oil Separator**

- ☐ Removing and installing. Refer to [⇒ S2.1 eparator, Removing and Installing](#), page 205 .

**18 - Bolt**

- ☐ Tightening sequence and specification. Refer to [⇒ Fig. ""Oil Separator- Tightening Sequence and Specification""](#), page 192 .

**19 - Oil Pan Upper Section**

- ☐ Removing and installing. Refer to [⇒ P1.4 an Upper Section, Removing and Installing](#), page 197 .

**20 - Bolt**

- ☐ 9 Nm

**21 - Bolt**

- ☐ Replace after removing
- ☐ Tightening sequence and tightening specification. Refer to [⇒ Fig. ""Oil Pan Upper Section - Tightening Sequence and Tightening Specification""](#), page 192

**22 - Oil Intake Pipe**

- ☐ Clean the screen if there are debris

**23 - Seal**

- ☐ Replace after removing
- ☐ In oil baffle; -item 6- [⇒ Item 6 \(page 190\)](#) mounted permanently

**24 - O-Ring**

- ☐ Replace after removing

**25 - O-Ring**

- ☐ No replacement part, part of the check valve delivery package

**26 - Check Valve**

- ☐ Replace after removing
- ☐ Clipped into oil baffle -item 6- [⇒ Item 6 \(page 190\)](#) .

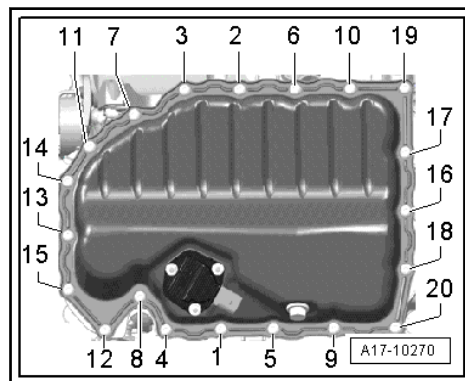
**27 - Oil Drain Plug**

- ☐ 30 Nm
- ☐ Replace after removing
- ☐ With permanent sealing ring

**28 - Nut**

- ☐ 9 Nm
- ☐ Engine codes CAWB and CCZA only

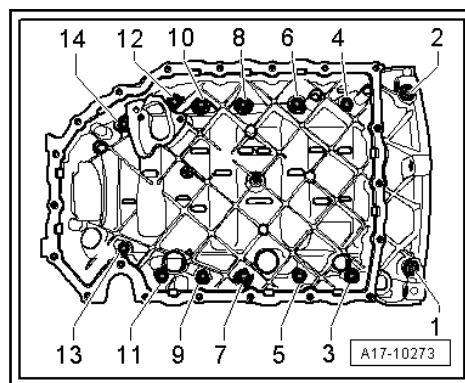
**Lower Oil Pan Section, Tightening Sequence and Tightening Specification**



- Tighten the new bolts in steps in the sequence -1 through 20- as follows:

| Step | Bolts          | Tightening Specification/Additional Turn |
|------|----------------|--|
| 1    | -1 through 20- | Tighten hand-tight                       |
| 2    | -1 through 20- | 8 Nm                                     |
| 3    | -1 through 20- | 45° additional turn                      |

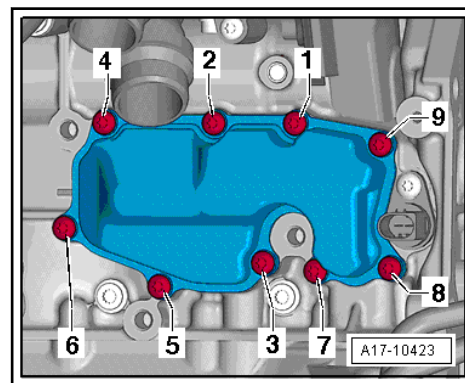
#### Oil Pan Upper Section - Tightening Sequence and Tightening Specification



- Tighten the new bolt in sequence -1 through 14- in 3 steps as follows:

| Step | Bolts          | Tightening Specification/Additional Turn |
|------|----------------|--|
| 1    | -1 through 14- | Tighten hand-tight                       |
| 2    | -1 through 14- | 15 Nm                                    |
| 3    | -1 through 14- | 90° additional turn                      |

#### Oil Separator- Tightening Sequence and Specification



- Tighten the bolts in the sequence -1 to 9-.

| Bolts         | Tightening Specification |
|---------------|--------------------------|
| -1 through 9- | 9 Nm                     |

## 1.2 Engine Oil



### Note

- ◆ *The oil level must not go above the MAX mark - danger of causing damage to the catalytic converter! Check the oil level. Refer to ⇒ [page 193](#).*
- ◆ *If large quantities of metal shavings or wear are detected during engine repairs, it may mean the crankshaft or connecting rod bearings are damaged. To prevent subsequent damage, perform the following procedures after the repair:*

### Oil Capacities

Refer to ⇒ Fluid Capacity Tables; Rep. Gr. 03

### Engine Oil Specifications

Refer to ⇒ Fluid Capacity Tables; Rep. Gr. 03.

### Replacing the Engine Oil

Refer to ⇒ Maintenance; Booklet 20.1; Procedure Descriptions; Engine Oil, Draining or Extracting and Filling, Replacing Oil Filter.

### Oil Level, Checking



### Note

*The oil level must not exceed the MAX marking - danger of damaging the catalytic converter!*

### Test Conditions

- Engine oil temperature at least 60 °C (140 °F)
- Vehicle must be at a level position.
- After stopping engine, wait a few minutes to allow oil to flow back into oil pan.

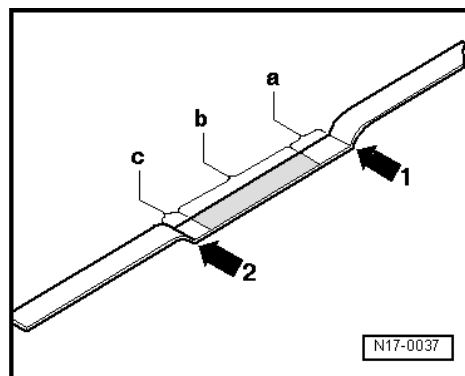
### Test Sequence

- Pull out the oil dipstick, wipe off with a clean cloth and insert it all the way.



- Remove the dipstick again and check the oil level.

Range of markings on dipstick:



a - Oil must not be added.

b - Oil may be added.

c - Oil must be added.



#### Note

*Oil level must not exceed max. marking -arrow 1- and must not fall short of min. marking -arrow 2-.*

## 1.3 Oil Pan Lower Section, Removing and Installing

### Special tools and workshop equipment required

- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Silicone Sealant
- ◆ Flat-Blade Scraper
- ◆ Hand Drill with Plastic Brush Attachment
- ◆ Protective Eyewear

### Removing

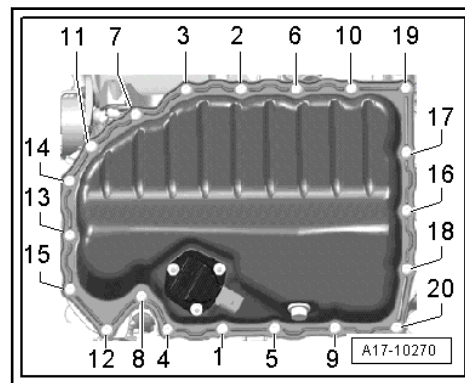
- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50; Noise Insulation.
- Drain the engine oil. Refer to ⇒ Maintenance; Booklet 20.1.



#### Note

*Follow all waste disposal regulations!*

- Remove the bolts in sequence -20 through 1-.



- Remove the lower oil pan section, and if necessary loosen by applying light strikes with a rubber hammer.

### Installing



#### Note

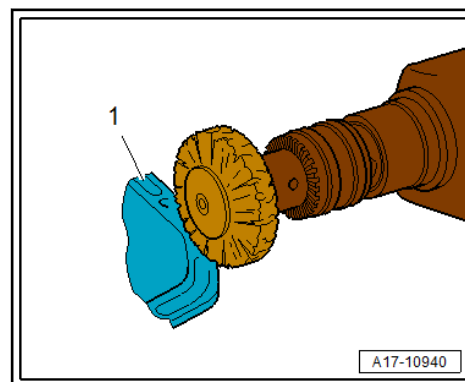
- ◆ *Sealing surfaces must be completely free of oil and grease.*
  - ◆ *Check the expiration date of the Silicone Sealant.*
  - ◆ *The lower oil pan section must be installed within 5 minutes after applying the Silicone Sealant.*
  - ◆ *Replace the bolts that were tightened with an additional turn.*
  - ◆ *Replace the gaskets, seals and self-locking nuts.*
- Remove any sealant residue on the upper section of the oil pan using a flat blade scraper.



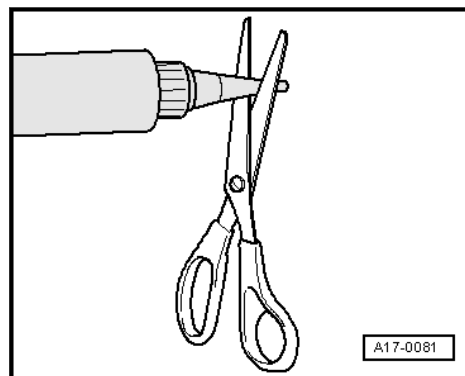
#### WARNING

**Risk of injuring the eyes from sealant residue.**

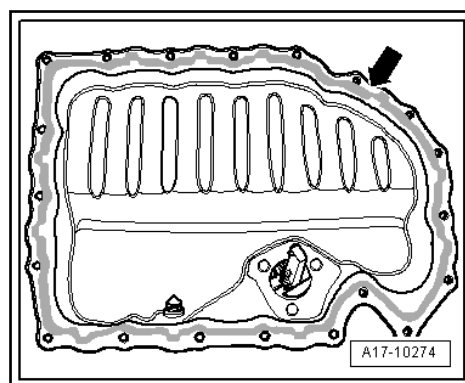
- **Wear protective eyewear.**
- Remove any remaining sealant from the oil pan lower section using, for example, a rotating plastic brush.



- Sealing surfaces must be free of oil and grease.
- Cut the tube nozzle at the front marking (nozzle diameter: approximately 3 mm).



- Apply the Silicone Sealant on the clean sealing surface of the cylinder head cover as shown -arrow-.

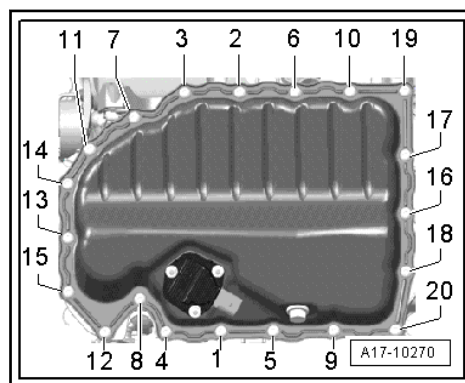


- Sealant bead thickness: 2 to 3 mm.



#### Note

- ◆ The lower oil pan section must be installed within 5 minutes after application of Silicone Sealant.
  - ◆ The sealant bead may not be thicker than specified, otherwise excess sealant could enter the oil pan and clog the oil intake pipe screen.
  - ◆ Be sure to check the expiration date of the sealant.
- Mount the oil pan lower section immediately and tighten the new bolts. Refer to ➤ [Fig. “Lower Oil Pan Section, Tightening Sequence and Tightening Specification”, page 191](#).



**Note**

*After installing the oil pan lower section, the sealant must dry for approximately 30 minutes. Only afterward may the engine oil be replenished.*

Install in reverse order of removal. Note the following:

- Refill engine oil. Refer to ⇒ Maintenance; Booklet 20.1.
- Check the oil level. Refer to ⇒ [O1.2 il", page 193](#) .

**Tightening Specification**

- ◆ Refer to ⇒ [-1.1 Oil Pan/Oil Pump", page 189](#)

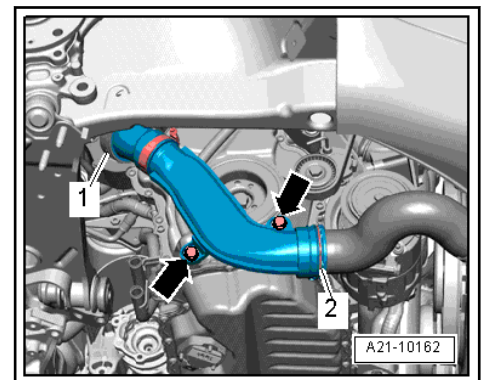
## 1.4 Oil Pan Upper Section, Removing and Installing

**Special tools and workshop equipment required**

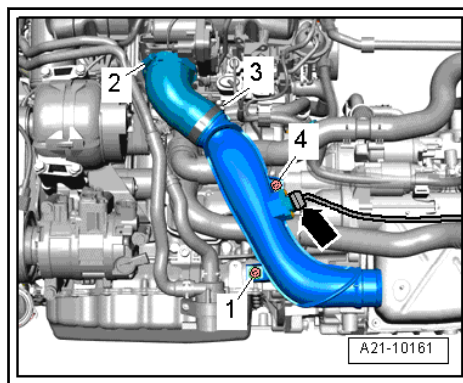
- ◆ Gauge - Brake Pad -VW136-
- ◆ Elbow Assembly Tool -T10118-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Silicone Sealant
- ◆ Flat-Blade Scraper
- ◆ Hand Drill with Plastic Brush Attachment
- ◆ Protective Eyewear

**Removing**

- Remove the transmission. Refer to ⇒ Rep. Gr. 34.
- Remove the oil pump. Refer to ⇒ [P1.5 ump, Removing and Installing", page 202](#) .
- Remove the transmission side sealing flange. Refer to ⇒ [F2.3 lunge, Removing and Installing, Transmission Side", page 60](#) .
- Remove the right front wheel housing liner. Refer to ⇒ Body Exterior; Rep. Gr. 66; Wheel Housing Liner; Front Wheel Housing Liner, Removing and Installing.
- Remove the bolts -arrows-.



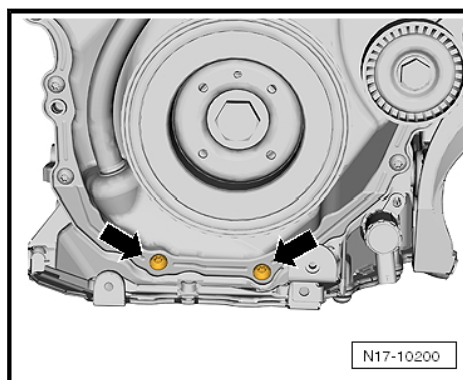
- Open the clamps -1 and 2- and remove the charge air pipe.
- Remove the bolt -1-.



- Remove the wiring harness bracket next to the After-Run Coolant Pump -V51- from the oil pan upper section.

To prevent leaks in the future, do not bend the lower timing chain cover and do not reach between the mounting points.

- Remove the bolts -arrows-.

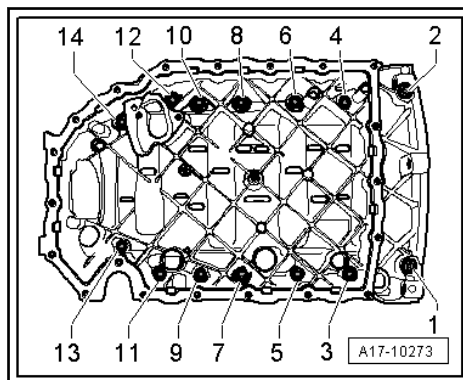


#### Note

*When removing the oil pan upper section, the chain tensioner spring for the oil pump motor will jump from the oil pan upper section to the lower timing chain cover. When removing the oil pan upper section, do not reach between the section and the lower timing chain cover.*

First pry the oil pan upper section out on the transmission side. When prying out, be careful not to bend the timing chain cover.

- Remove the bolts in sequence -14 through 1- and pry off the oil pan upper section.





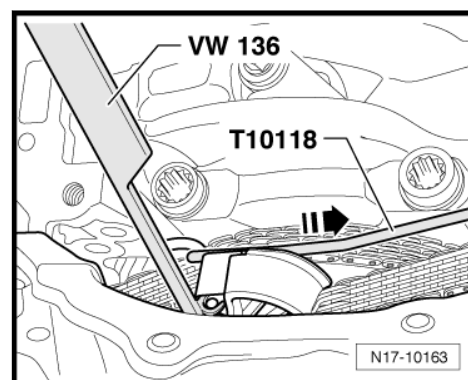


## Installing



### Note

- ◆ *Sealing surfaces must be completely free of oil and grease.*
- ◆ *Check the expiration date of the Silicone Sealant.*
- ◆ *The oil pan upper section must be installed within five minutes after applying the Silicone Sealant.*
- Using the Elbow Assembly Tool -T10118-, pull the chain tensioner spring for the oil pump drive in the direction of the -arrow-.



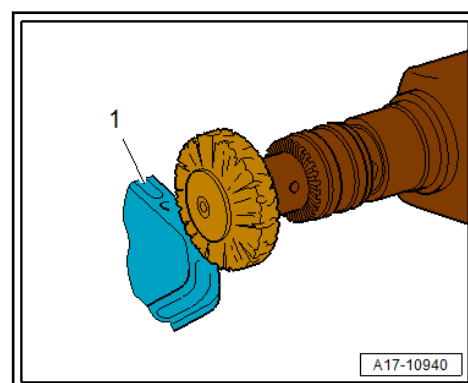
- To secure the Gauge - Brake Pad -VW136-, as shown, insert it into the glide rail hole.
- Remove any sealant residue on the cylinder block using a flat blade scraper.



### WARNING

**Risk of injuring the eyes from sealant residue.**

- **Wear protective eyewear.**
- Remove the remaining sealant on the oil pan upper section and on the lower timing chain cover, for example with a rotating plastic brush.

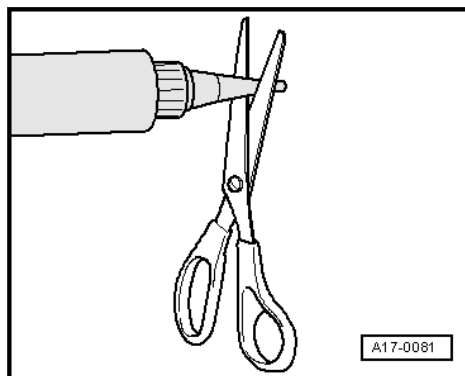




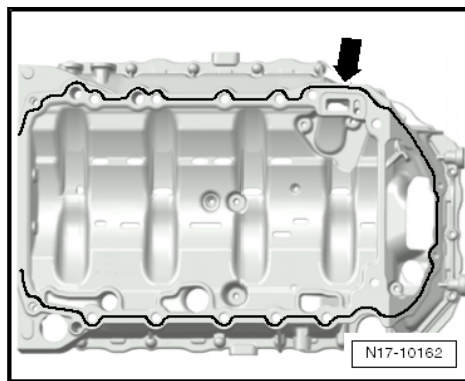
### Note

*See if the timing chain cover is deformed. Then mount the oil pan upper section without any sealant and check the gap between the cover and the oil pan upper section. If deformation is found and the cover cannot be aligned, replace the cover after installing the oil pan upper section.*

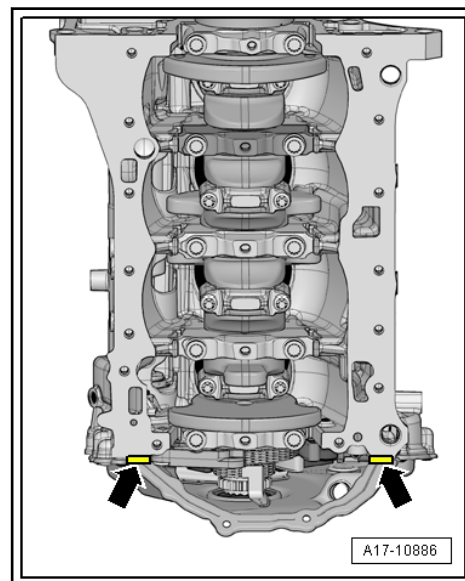
- Sealing surfaces must be free of oil and grease.
- Check for dirt in the oil passages in the oil pan upper section and in the crankshaft housing.
- Cut the tube nozzle at the front marking (nozzle diameter: approximately 3 mm).



- Apply the Silicone Sealant on the clean sealing surface of the upper oil pan section as shown -arrows-.



- In addition, apply a small amount of Silicone Sealant between the cylinder block and the timing chain cover -arrows-.



- Sealant bead thickness: 2 to 3 mm.

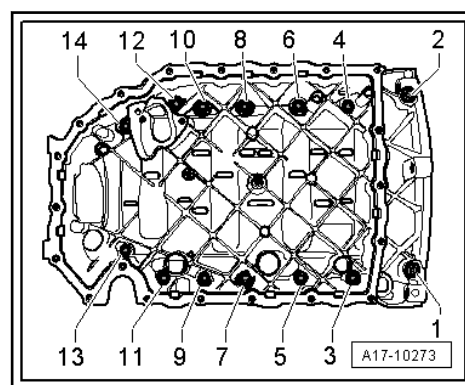


#### Note

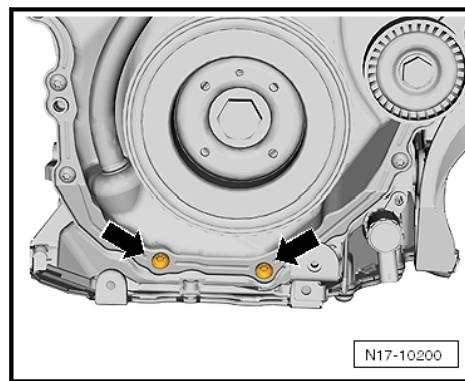
- ◆ *The oil pan upper section must be installed within five minutes after applying the Silicone Sealant.*
- ◆ *The sealant bead may not be thicker than specified, otherwise excess sealant could enter the oil pan and clog the oil intake pipe screen.*
- On the transmission side, the oil pan upper section and the crankcase must align.

#### Bolts -1 through 14-

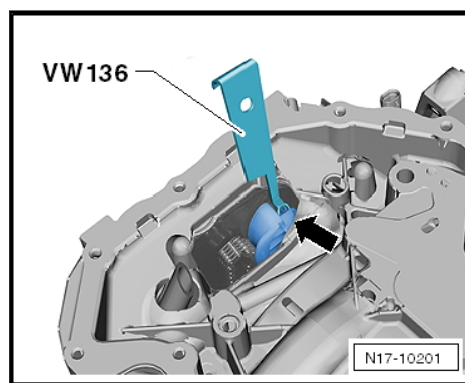
- Mount the oil pan upper section immediately and tighten the bolts as follows. Refer to ⇒ [Fig. “Oil Pan Upper Section - Tightening Sequence and Tightening Specification”](#), page 192 .



- Install the bolts -arrows-. Refer to ⇒ [Fig. “Lower Timing Chain Cover - Tightening Specifications and Tightening Sequence”](#), page 116 .



- Remove the Gauge - Brake Pad -VW136- from the glide rail -arrow-. The spring now returns to the installation position.



Further assembly is performed in the reverse order of the removal.

#### Tightening Specification

- ◆ Refer to ➤ [Fig. “Lower Timing Chain Cover - Tightening Specifications and Tightening Sequence”, page 116](#)
- ◆ Refer to ➤ [-1.1 Oil Pan/Oil Pump”, page 189](#)
- ◆ Refer to ➤ [-2.2 Charge Air System”, page 283](#)

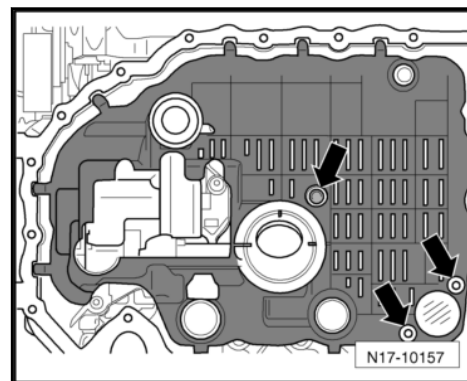
## 1.5 Oil Pump, Removing and Installing

#### Special tools and workshop equipment required

- ◆ Elbow Assembly Tool -T10118-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-

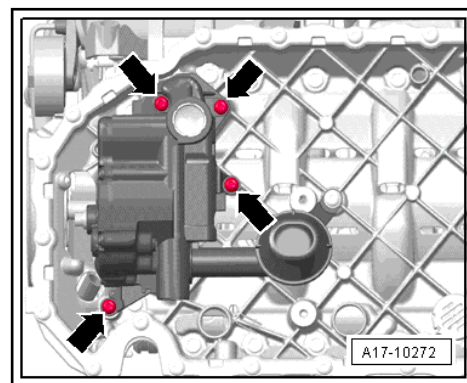
#### Removing

- Remove the oil pan lower section. Refer to ➤ [P1.3 an Lower Section, Removing and Installing”, page 194](#) .
- Remove the oil baffle -arrows-.

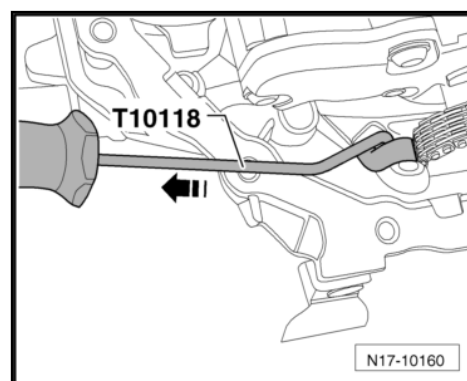
**Note**

*The following procedure must be performed in one operation. A second technician is required for this.*

- Remove the bolts -arrows-.

**Installing**

- Pull back the chain tensioner using the Elbow Assembly Tool -T10118-. Fit the drive chain on the oil pump with the oil intake pipe.



The rest of the installation is the reverse order of removal. Note the following:

- Check the oil intake pipe screen and the oil channels in the oil pan upper section for contamination before installing the oil pump.
- Make sure there are both alignment bushings for centering the oil pump.
- Replace the oil baffle.



The oil baffle gets a new check valve (-item 26- ➔ [Item 26 \(page 191\)](#) ), and a new seal -item 23- ➔ [Item 23 \(page 191\)](#) .



#### Note

*There are plastic ribs on the oil baffle that deform permanently when tightening. The plastic ribs ensure the oil baffle has no play and does not rattle. Because of this, always replace the oil baffle.*

#### Tightening Specification

- ◆ Refer to ➔ [-1.1 Oil Pan/Oil Pump](#) , [page 189](#)



## 2 Crankcase Ventilation

⇒ [S2.1 eparator, Removing and Installing", page 205](#)

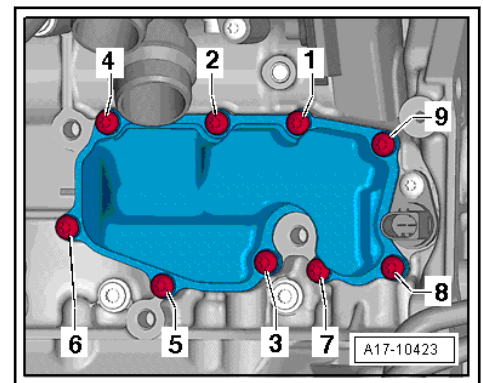
### 2.1 Oil Separator, Removing and Installing

Special tools and workshop equipment required

- ◆ Torque Wrench 1331 5-50Nm -VAG1331-

#### Removing

- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50; Noise Insulation.
- Remove the bolts -9 through 1- and remove the oil separator.



#### Note

- ◆ *Risk of contaminating the lubricating system.*
- ◆ *Cover open engine components.*

#### Installing



#### Note

- ◆ *Replace the gaskets and seals.*
- ◆ *Install only approved clamps for securing hose connections. Refer to Parts Catalog.*

Install in reverse order of removal. Note the following:

#### Tightening Specification

- ◆ Refer to ⇒ [-1.1 Oil Pan/Oil Pump", page 189](#)



### 3 Oil Filter/Oil Pressure Switch

⇒ -3.1 Oil Filter Housing / Oil Pressure Switch F1 ", page 206

⇒ -3.2 Oil Filter Housing / Oil Pressure Switch F22 and Reduced Oil Pressure Switch F378 ", page 208

⇒ O3.3 il Cooler, Removing and Installing", page 210

⇒ P3.4 ressure and Oil Pressure Switch F1, Checking", page 211

⇒ P3.5 ressure and Reduced Oil Pressure Switch F378, Checking", page 213

⇒ O3.6 il Pressure Switch F22, Removing and Installing", page 215

⇒ R3.7 educed Oil Pressure Switch F378, Removing and Installing", page 217

⇒ O3.8 il Pressure Regulation Valve N428, Removing and Installing", page 218

#### 3.1 Overview - Oil Filter Housing / Oil Pressure Switch -F1-



**1 - Sub-Assembly Bracket**

- ☐ Removing and installing. Refer to ⇒ [B1.6 racket, Removing and Installing", page 52](#).

**2 - Oil Pressure Switch -F1-**

- ☐ 20 Nm
- ☐ 1.4 bar (20.30 psi) - black
- ☐ Checking. Refer to ⇒ [P3.4 ressure and Oil Pressure Switch F1, Checking", page 211](#).
- ☐ Remove using the Socket and Jointed Extension - 24mm - T40175-

**3 - Seal**

- ☐ Replace after removing

**4 - O-Ring**

- ☐ No replacement part, part of the valve unit delivery package

**5 - O-Ring**

- ☐ No replacement part, part of the valve unit delivery package

**6 - Valve Unit**

- ☐ With O-rings

**7 - Oil Filter**

- ☐ 22 Nm
- ☐ Observe the notes. Refer to ⇒ [page 193](#).
- ☐ Removing and installing. Refer to ⇒ Maintenance; Booklet 20.1.
- ☐ Remove and install using the Wrench - Oil Filter -3417-

**8 - Bolt**

- ☐ 15 Nm

**9 - Connection****10 - Seal**

- ☐ Replace after removing

**11 - Engine Oil Cooler**

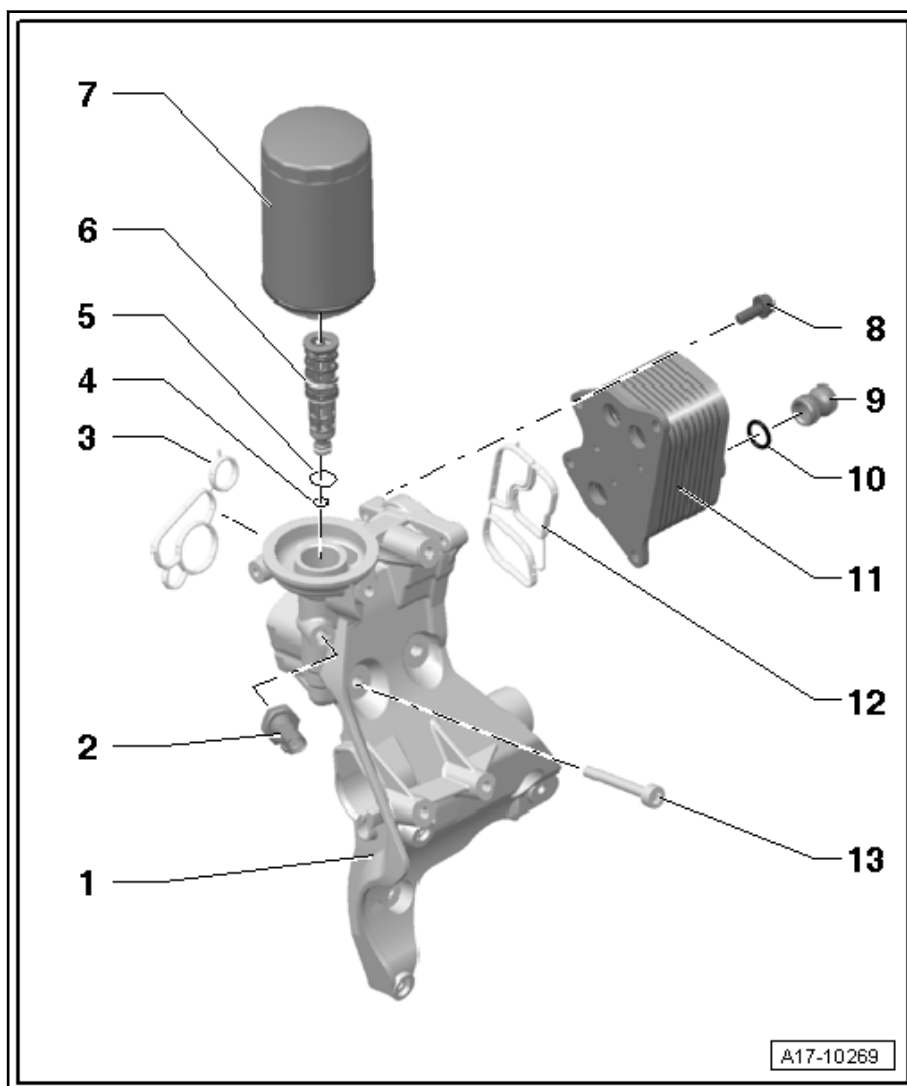
- ☐ Observe the notes. Refer to ⇒ [page 193](#).
- ☐ Make sure there is enough space to the surrounding components
- ☐ Removing and installing. Refer to ⇒ [O3.3 il Cooler, Removing and Installing", page 210](#).
- ☐ Coolant hose connection diagram. Refer to ⇒ [D1.1 iagram - Coolant Hoses", page 223](#).

**12 - Seal**

- ☐ Replace after removing

**13 - Bolt**

- ☐ Tightening sequence and specification. Refer to ⇒ [Fig. ""Accessory Assembly Bracket - Tightening Sequence and Tightening Specification""", page 44](#).



A17-10269



## **3.2 Overview - Oil Filter Housing / Oil Pressure Switch -F22- and Reduced Oil Pressure Switch -F378-**



### 1 - Sub-Assembly Bracket

- ☐ Removing and installing. Refer to ⇒ [B1.6 racket, Removing and Installing", page 52](#) .

### 2 - Oil Pressure Switch -F22-

- ☐ 20 Nm
- ☐ Blue insulation
- ☐ Removing and installing. Refer to ⇒ [O3.6 il Pressure Switch F22, Removing and Installing", page 215](#) .
- ☐ Checking. Refer to ⇒ [P3.5 ressure and Reduced Oil Pressure Switch F378, Checking", page 213](#) .

### 3 - Reduced Oil Pressure Switch -F378-

- ☐ 20 Nm
- ☐ Brown insulation
- ☐ Removing and installing. Refer to ⇒ [R3.7 educed Oil Pressure Switch F378, Removing and Installing", page 217](#) .
- ☐ Checking. Refer to ⇒ [P3.5 ressure and Reduced Oil Pressure Switch F378, Checking", page 213](#) .

### 4 - Seal

- ☐ Replace after removing

### 5 - O-Ring

- ☐ No replacement part, part of the valve unit delivery package

### 6 - O-Ring

- ☐ No replacement part, part of the valve unit delivery package

### 7 - Valve Unit

- ☐ With O-rings

### 8 - Oil Filter

- ☐ 22 Nm
- ☐ Observe the notes. Refer to ⇒ [page 193](#) .
- ☐ Removing and installing. Refer to ⇒ Maintenance; Booklet 20.1.
- ☐ Remove and install using the Wrench - Oil Filter -3417-

### 9 - Bolt

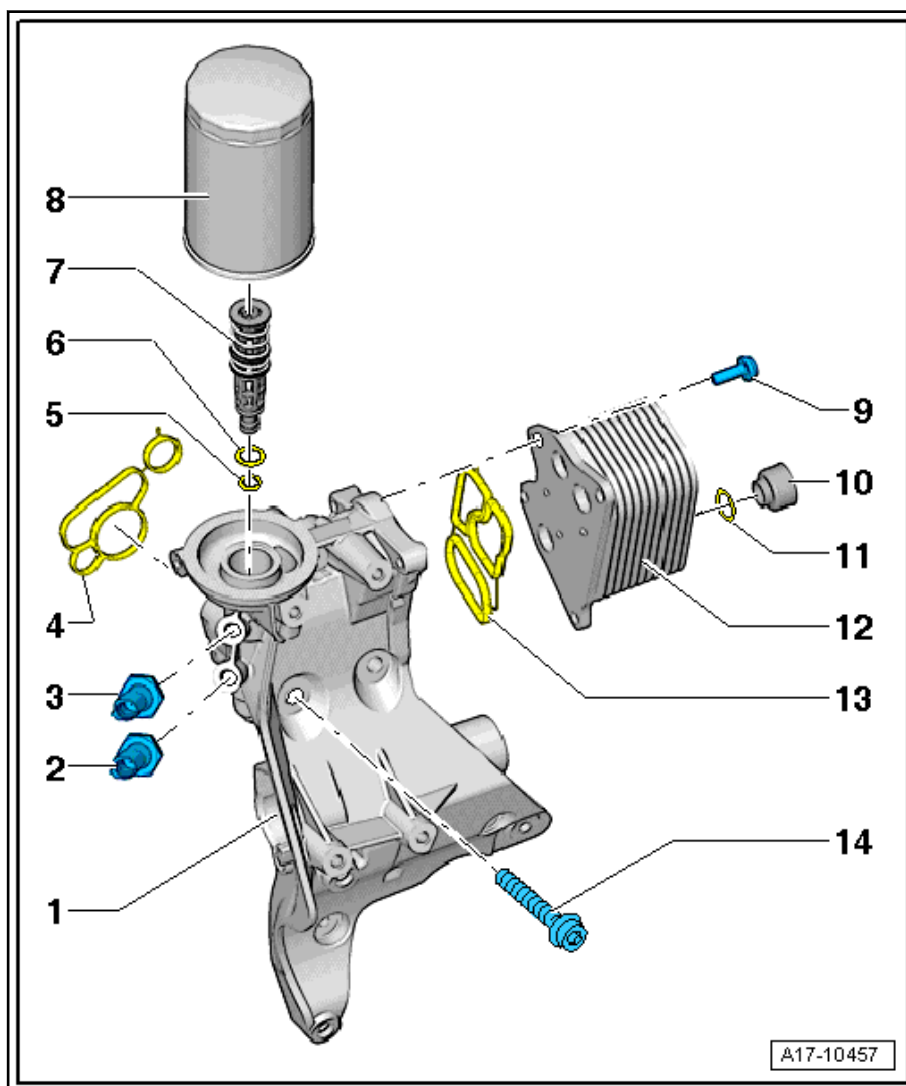
- ☐ 15 Nm

### 10 - Connection

### 11 - Seal

- ☐ Replace after removing

### 12 - Engine Oil Cooler





- ☐ Observe the notes. Refer to ➤ [page 193](#) .
- ☐ Make sure there is enough space to the surrounding components
- ☐ Removing and installing. Refer to ➤ [O3.3 il Cooler, Removing and Installing](#)”, [page 210](#) .
- ☐ Coolant hose connection diagram. Refer to ➤ [D1.1 iagram - Coolant Hoses](#)”, [page 223](#) .

### 13 - Seal

- ☐ Replace after removing

### 14 - Bolt

- ☐ Replace after removing
- ☐ Tightening sequence. Refer to ➤ [Fig. ““Accessory Assembly Bracket - Tightening Sequence and Tightening Specification””, \[page 44\]\(#\) .](#)

## 3.3 Engine Oil Cooler, Removing and Installing

### Special tools and workshop equipment required

- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Drip Tray for VAG1202A -VAG1306- or Shop Crane - Drip Tray -VAS6208-

### Removing

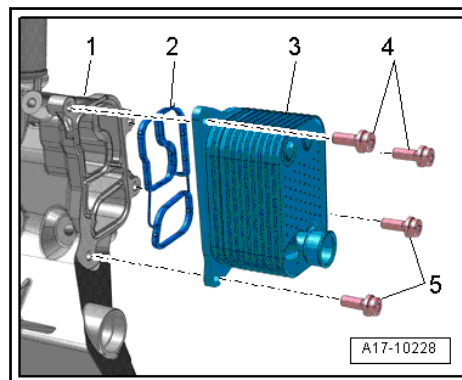
#### WARNING

The cooling system is under pressure when the engine is warm. Risk of scalding due to hot steam and hot coolant.

Scalding the skin and other parts of the body is possible.

- Wear safety gloves.
- Wear protective eyewear.
- Reduce the pressure by covering the coolant expansion tank cap with a cloth and carefully opening it.

- Drain the coolant. Refer to ➤ [D1.3 raining and Filling](#)”, [page 226](#) .
- Remove the sub-assembly bracket. Refer to ➤ [B1.6 racket, Removing and Installing](#)”, [page 52](#) .
- Remove the bolts -4 and 5- and remove the engine oil cooler -3- with the seal -2-.



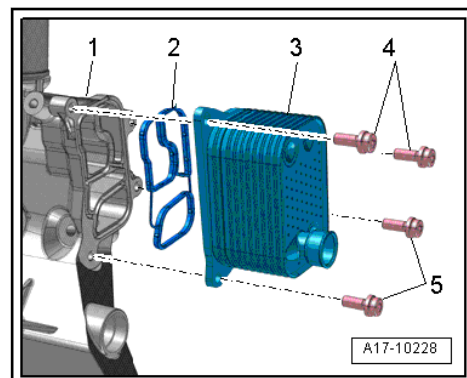
### Installing

Install in reverse order of removal. Note the following:

- ◆ Replace the gaskets and seals.



- ◆ Install only approved clamps for securing hose connections. Refer to Parts Catalog.
- Install the engine oil cooler -3- with a new seal -2-.



### Tightening Specification

- ◆ Refer to ⇒ [-3.1 Oil Filter Housing / Oil Pressure Switch F1-](#), [page 206](#)
- ◆ Refer to ⇒ [Fig. “Accessory Assembly Bracket - Tightening Sequence and Tightening Specification”](#), [page 44](#)

## 3.4 Oil Pressure and Oil Pressure Switch -F1-, Checking

### Special tools and workshop equipment required

- ◆ Oil Pressure Gauge Kit -VAG1342-
- ◆ Voltage Tester -VAS6839-
- ◆ Connector Test Set -VAG1594D-
- ◆ Socket and Jointed Extension - 24mm -T40175-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Vehicle Diagnostic Tester

### Test Conditions

- The engine oil level is OK, Checking. Refer to ⇒ [page 193](#) .
- The engine oil temperature is at least 80 °C (176 °F) (the Radiator Fan must start up once).

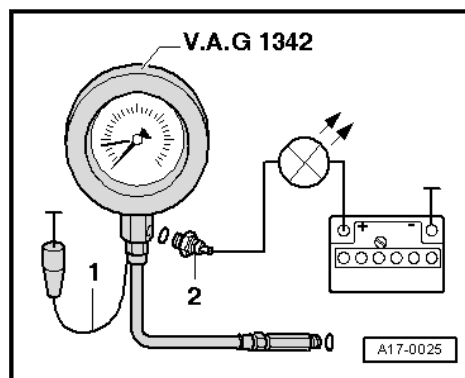


### Note

*For the function test and servicing of the optical and acoustic oil pressure warning: Refer to ⇒ Wiring diagrams, Troubleshooting & Component locations and the Vehicle Diagnostic Tester “Function and Component Selection”.*

### Test Sequence

- Remove the connector from the Oil Pressure Switch -F1-.
- Remove the Oil Pressure Switch -F1- -2- using the Socket and Jointed Extension - 24mm -T40175-. Screw the Oil Pressure Switch -F1- into the Oil Pressure Gauge Kit -VAG1342-.



- Install the Tester in place of the Oil Pressure Switch -F1- into the bracket.
- Connect the brown wire -1- of the Tester to the ground.
- Connect the Voltage Tester -VAS6839- to Battery positive (+) terminal and the Oil Pressure Switch -F1- using adapter cables from the Connector Test Set -VAG1594D-.
- LED must not turn on.

If the LED turns on:

- Replace the 1.4 bar (20.30 psi) Oil Pressure Switch -F1-.

If the LED does not light up:

- Start the engine and slowly increase the RPM:
- The LED must turn on at 1.2 to 1.6 bar (17.4 to 23.2 psi) pressure. If it does not, replace the Oil Pressure Switch.
- Increase engine speed (RPM) further:
- At 2000 RPM and an oil temperature of 80 °C (176 °F), the oil pressure must be between 2.7 to 4.5 bar (39.16 to 65.26 psi).

At higher engine speeds oil pressure must not exceed 7 bar (101.52 psi)

If the specification is not obtained:

- Check the oil intake pipe strainer -item 22- ➔ [Item 22 \(page 191\)](#) for contamination.



#### Note

*Also, mechanical damage, for example, bearing damage can also be the cause of too low oil pressure.*

If no error can be found:

- Replace the oil pump. Refer to ➔ [P1.5 ump, Removing and Installing", page 202](#) .

If the specified value is exceeded:

- Check the oil channels.

#### Tightening Specification

- ♦ Refer to ➔ [-3.1 Oil Filter Housing / Oil Pressure Switch F1 ", page 206](#)



### 3.5 Oil Pressure and Reduced Oil Pressure Switch -F378-, Checking

#### Special tools and workshop equipment required

- ◆ Oil Pressure Gauge Kit -VAG1342-
- ◆ Voltage Tester -VAS6839-
- ◆ Connector Test Set -VAG1594D-
- ◆ Socket and Jointed Extension - 24mm -T40175-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Vehicle Diagnostic Tester

#### Conditions

- Engine oil level OK
- The engine oil temperature at least 80 °C (176 °F) (the radiator fan must start up once).

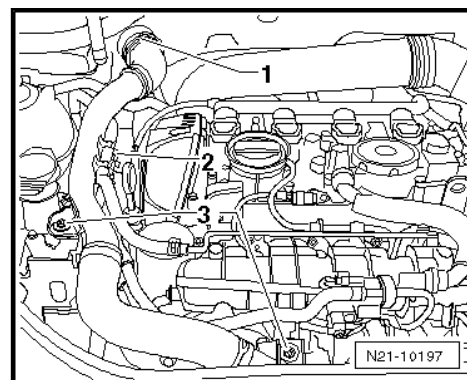


#### Note

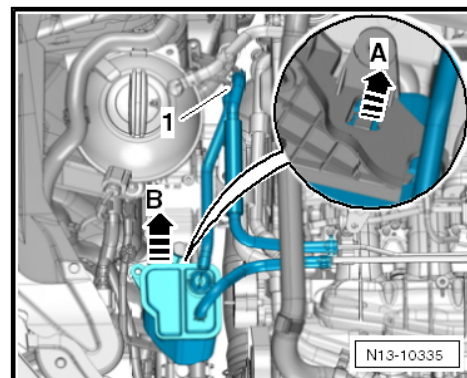
*For the function test and servicing of the optical and acoustic oil pressure warning: Refer to ⇒ Wiring diagrams, Troubleshooting & Component locations and the Vehicle Diagnostic Tester "Function and Component Selection".*

#### Oil Pressure, Checking

- Vehicles with sound generator: open the locking mechanism -1-, unclip the fuel line -2- and loosen the bolt -3- on the EVAP canister. Move the charge air pipe aside.



- Disconnect the vent line -1-, unlock the EVAP canister in direction of -arrow A- and remove it upward in direction of -arrow B-. Move the EVAP canister to the side.

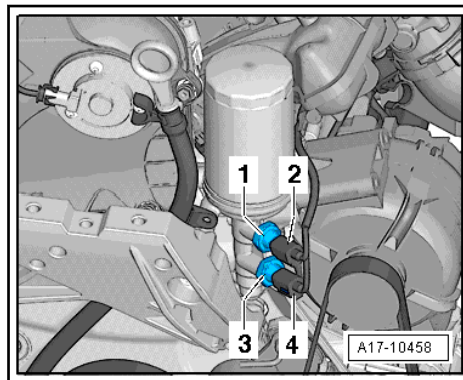




#### Note

*Place a cloth under the sub-assembly bracket to collect leaking engine oil.*

- Disconnect the connector -2- from the Reduced Oil Pressure Switch -F378- (brown).



- Remove the Reduced Oil Pressure Switch -F378- -1-.
- Install the Oil Pressure Gauge Kit -VAG1342- into the oil filter bracket in place of the oil pressure switch.
- Install the Reduced Oil Pressure Switch -F378- in the Oil Pressure Gauge Kit -VAG1342-.
- Connect the charge air pipe and EVAP canister vent line.
- Start the engine.
- Oil pressure when the vehicle is idling: 1.2 to 2.1 bar (17.4 to 30 psi)
- Oil pressure at 2000 RPM: 1.6 to 2.1 bar (23.2 to 30.5 psi).
- Oil pressure at 3700 RPM: 3 to 4 bar (43 to 58 psi)



#### Note

*The oil pressure may be 3 to 4 bar (43 to 58 psi) at 2,000 RPM during the first 1,000 km.*

If the specification is not obtained:

- Check the oil intake pipe screen for contamination -item 22- ⇒ [Item 22 \(page 191\)](#) .
- Check the Oil Pressure Regulation Valve -N428-. Refer to Vehicle Diagnostic Tester.



#### Note

*Also, mechanical damage, for example, bearing damage can also be the cause of too low oil pressure.*

If no error can be found:

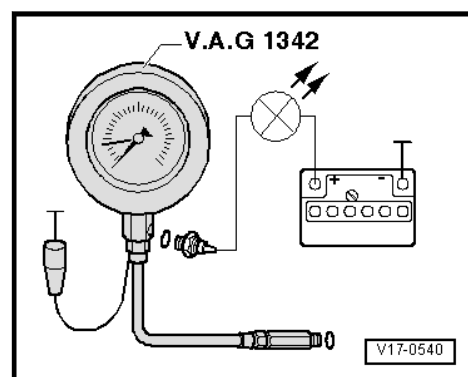
- Replace the oil pump. Refer to ⇒ [P1.5 ump, Removing and Installing](#)”, [page 202](#) .





### Checking the Reduced Oil Pressure Switch -F378- (Brown):

- Turn off the engine.
- Connect brown wire on the tester to the ground (-).



- Connect the Voltage Tester -VAS6839- with adapter cables from the Connector Test Set -VAG1594D- to the battery positive (+) and the Reduced Oil Pressure Switch -F378- (brown).
- LED must not turn on.
- If the LED illuminates, replace the Reduced Oil Pressure Switch -F378-.

If the LED does not light up:

- Start the engine: the LED must come on at 0.55 to 0.85 bar (7.97 to 12.32 psi). If it does not, replace the oil pressure switch.

### Checking the Oil Pressure Switch -F22- (Blue):

- Turn off the engine.
- Connect the Voltage Tester -VAS6839- to battery positive (+) and the Oil Pressure Switch -F22- (blue) using adapter cables from the Connector Test Set -VAG1594D-.
- LED must not turn on.
- If the LED illuminates, replace the Oil Pressure Switch -F22-.

If the LED does not light up:

- Start the engine and increase the RPM. The LED must turn on when the pressure is 2.15 to 2.95 bar (31.18 to 42.78 psi). Otherwise, replace the oil pressure switch.

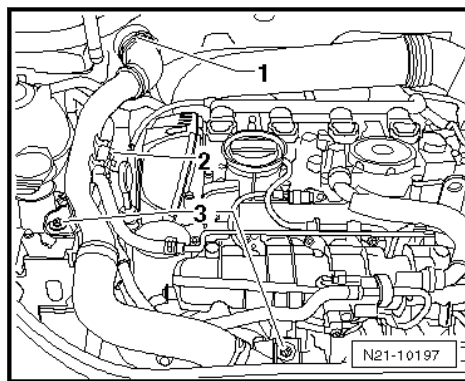
## 3.6 Oil Pressure Switch -F22-, Removing and Installing

### Special tools and workshop equipment required

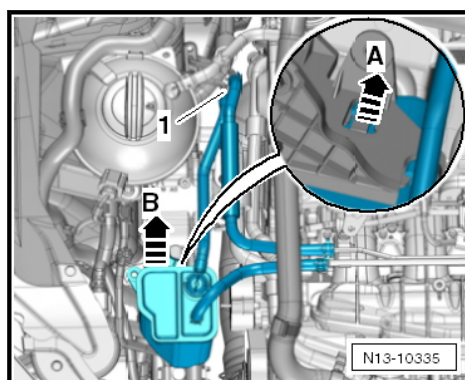
- ◆ Socket and Jointed Extension - 24mm -T40175-

### Removing

- Vehicles with sound generator: open the locking mechanism -1-, unclip the fuel lines -2- and loosen the bolt -3- on the EVAP canister. Move the charge air pipe aside.



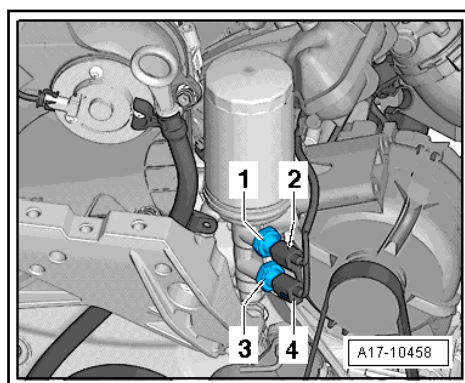
- Disconnect the vent line -1-, unlock the EVAP canister in direction of -arrow A- and remove it upward in direction of -arrow B-. Move the EVAP canister to the side.



#### Note

*Place a cloth under the sub-assembly bracket to collect leaking engine oil.*

- Disconnect the connector -4- from the Oil Pressure Switch -F22-.



- Remove the Oil Pressure Switch -F22- -3-.

#### Installing

Install in reverse order of removal and note the following:

- ◆ Replace the seal.
- ◆ To prevent oil loss, immediately insert the new Oil Pressure Switch -F22- in the opening.
- ◆ Check the oil level.



## Tightening Specification

- ◆ Refer to ⇒ [-3.2 Oil Filter Housing / Oil Pressure Switch F22 and Reduced Oil Pressure Switch F378-](#), page 208

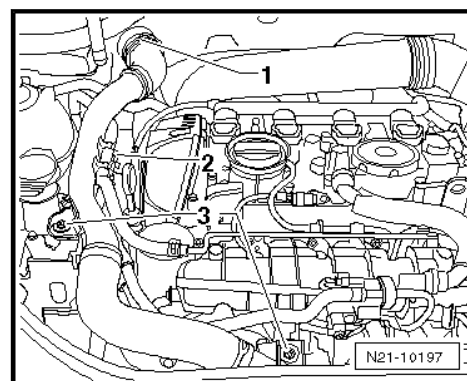
## 3.7 Reduced Oil Pressure Switch -F378-, Removing and Installing

### Special tools and workshop equipment required

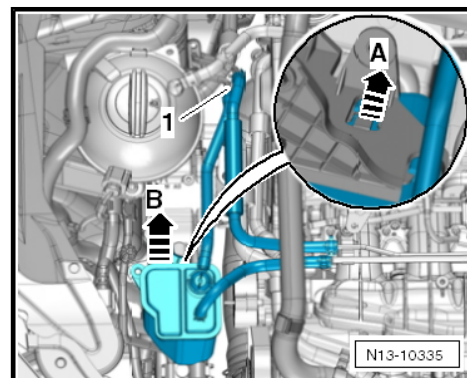
- ◆ Socket and Jointed Extension - 24mm -T40175-

### Removing

- Vehicles with sound generator: open the locking mechanism -1-, unclip the fuel lines -2- and loosen the bolt -3- on the EVAP canister. Move the charge air pipe aside.



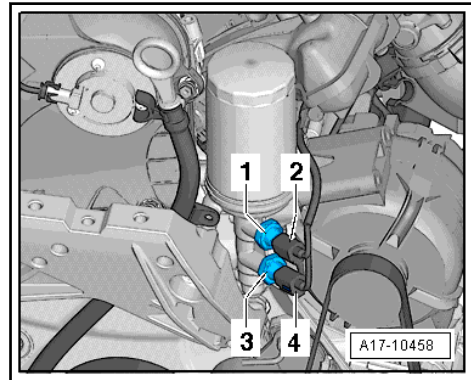
- Disconnect the vent line -1-, unlock the EVAP canister in direction of -arrow A- and remove it upward in direction of -arrow B-. Move the EVAP canister to the side.



### Note

*Place a cloth under the sub-assembly bracket to collect leaking engine oil.*

- Disconnect the connector -2- from the Reduced Oil Pressure Switch -F378-.
- Remove the Reduced Oil Pressure Switch -F378- -1-.



### Installing

Install in reverse order of removal and note the following:

- ◆ Replace the seal.
- ◆ To prevent oil loss, immediately insert the new Oil Pressure Switch -F1- in the opening.
- ◆ Check the oil level.

### Tightening Specification

- ◆ Refer to ⇒ [-3.2 Oil Filter Housing / Oil Pressure Switch F22 and Reduced Oil Pressure Switch F378](#) ", page 208

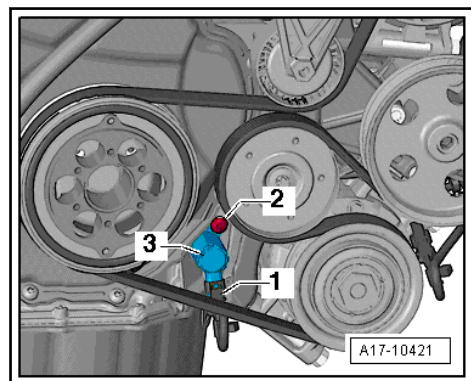
## 3.8 Oil Pressure Regulation Valve -N428-, Removing and Installing

### Special tools and workshop equipment required

- ◆ Used Oil Collection and Extraction Unit -SMN372500-

### Removing

- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50; Noise Insulation.
- Place the Used Oil Collection and Extraction Unit - SMN372500- under the engine.
- Disconnect the connector -1-.
- Remove the bolt -2- and the Oil Pressure Regulation Valve -N428- -3-.



### Installing

Install in reverse order of removal and note the following:

- ◆ Replace the O-ring.



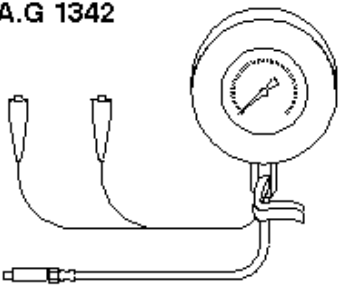
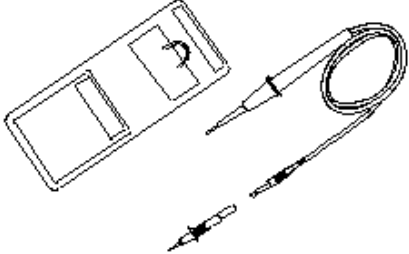

### Tightening Specification

- ◆ Refer to ➤ [-3.2 Oil Filter Housing / Oil Pressure Switch F22 and Reduced Oil Pressure Switch F378", page 208](#)



## 4 Special Tools

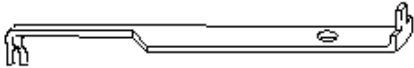
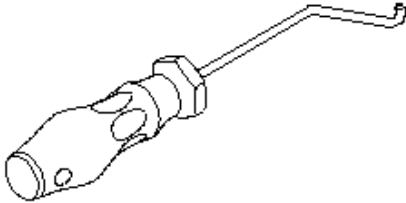

Special tools and workshop equipment required

|   |   |
|---|---|
| <b>V.A.G 1342</b><br>    | <b>V.A.G 1527 B</b><br> |
| <b>V.A.G 1594 C</b><br> |   |
|   |   |

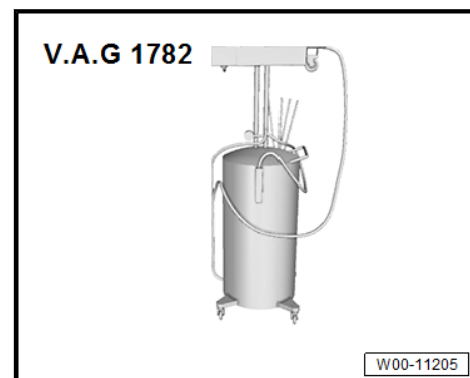
W17-10002

- ◆ Oil Pressure Gauge Kit -VAG1342-
- ◆ Voltage Tester -VAS6839-
- ◆ Connector Test Set -VAG1594D-



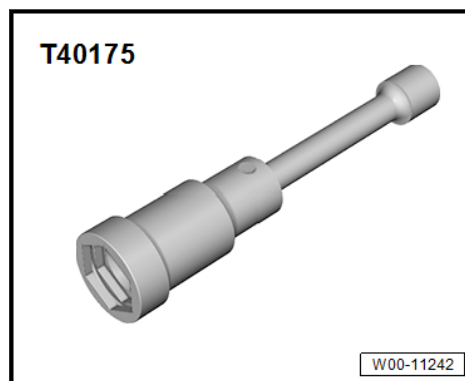
|   |  |
|---|--|
| <p><b>VW 136</b></p>      | <p><b>T10118</b></p>  |
| <p><b>V.A.G 1331</b></p>  |  |
|   | <p>W17-10010</p>   |

- ◆ Gauge - Brake Pad -VW136-
- ◆ Elbow Assembly Tool -T10118-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Used Oil Collection and Extraction Unit -SMN372500-





- ◆ Socket and Jointed Extension - 24mm -T40175-



- ◆ Drip Tray for VAG1202A -VAG1306- or Shop Crane - Drip Tray -VAS6208-



- ◆ Vehicle Diagnostic Tester (not illustrated)





## 19 – Cooling System

### 1 Coolant System/Coolant

⇒ [D1.1 iagram - Coolant Hoses", page 223](#)

⇒ [S1.2 ystem, Checking for Leaks", page 224](#)

⇒ [D1.3 raining and Filling", page 226](#)

#### 1.1 Connection Diagram - Coolant Hoses

⇒ [D1.1.1 iagram - Coolant Hoses, Vehicles with Manual Transmission", page 223](#)

⇒ [D1.1.2 iagram - Coolant Hoses, Vehicles with DSG® Transmission", page 223](#)

##### 1.1.1 Connection Diagram - Coolant Hoses, Vehicles with Manual Transmission

1 - Radiator

2 - After-Run Coolant Pump  
-V51-

3 - Coolant Pump

4 - Coolant Thermostat

5 - Engine Oil Cooler

6 - Cylinder Head and Cylinder Block

7 - Turbocharger

8 - Coolant Reservoir

☐ With cap

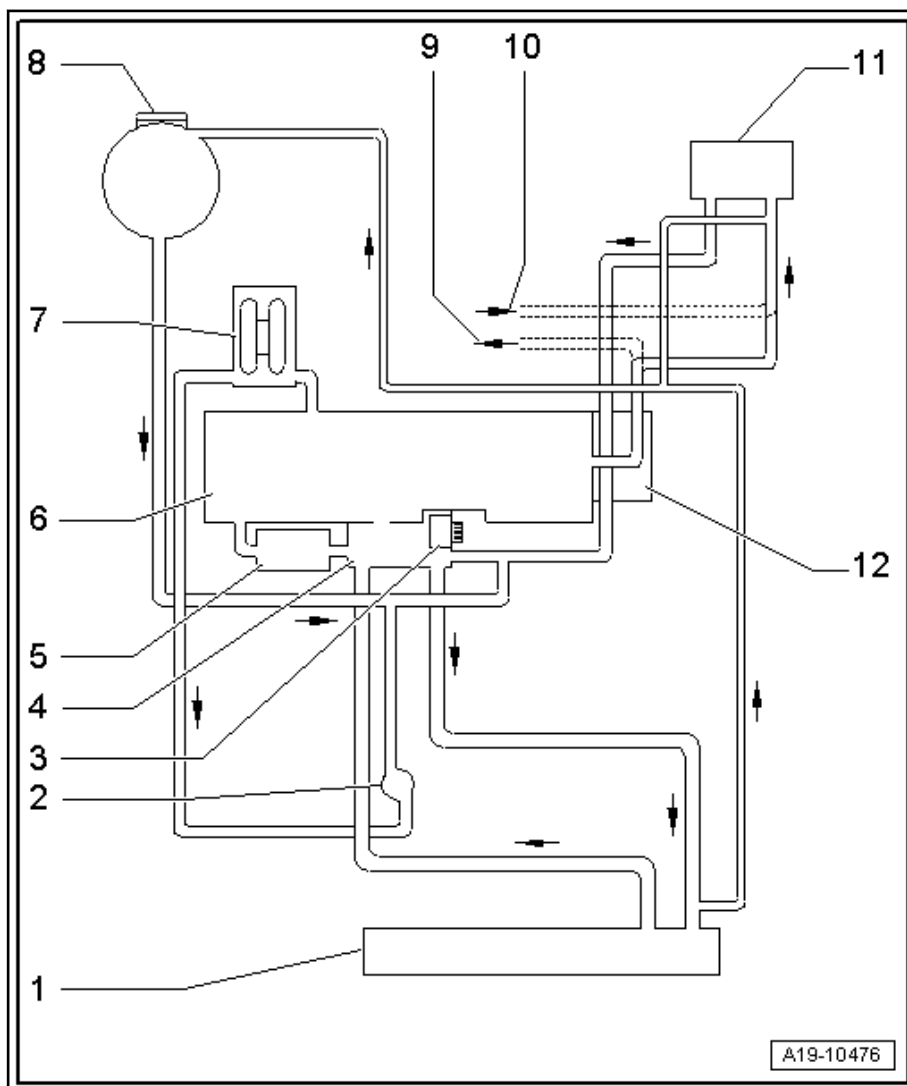
☐ Check the pressure valve in the cap. Refer to ⇒ [S1.2 ystem, Checking for Leaks", page 224](#)

9 - To the Auxiliary Heater

10 - From the Auxiliary Heater

11 - Heater Core

12 - Coolant Connection



A19-10476

##### 1.1.2 Connection Diagram - Coolant Hoses, Vehicles with DSG® Transmission



1 - Radiator

2 - After-Run Coolant Pump  
-V51-

3 - Coolant Thermostat

4 - Coolant Pump

5 - Engine Oil Cooler

6 - Cylinder Head and Cylinder Block

7 - Turbocharger

8 - Coolant Reservoir

☐ With cap

☐ Check the pressure valve in the cap. Refer to ➤ [S1.2 ystem, Checking for Leaks](#), page 224

9 - To the Auxiliary Heater

10 - From the Auxiliary Heater

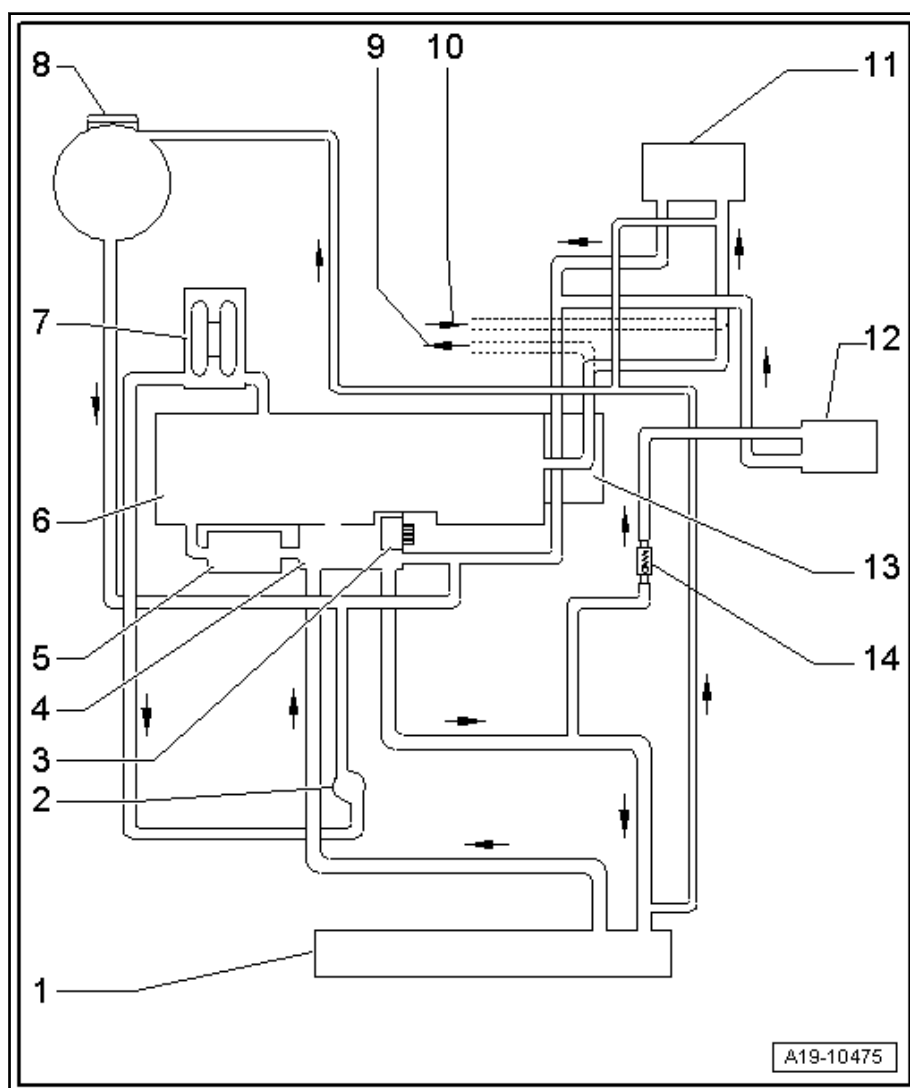
11 - Heater Core

12 - Transmission Fluid Cooler

13 - Coolant Connection

14 - Coolant Thermostat for the Transmission Fluid Cooler

☐ On some vehicles, the thermostat is located on the outflow side of the transmission oil cooler -item 12- ➤ [Item 12 \(page 224\)](#) .



## 1.2 Cooling System, Checking for Leaks

### Special tools and workshop equipment required

- ◆ Cooling System Tester -VAG1274B-
- ◆ Cooling System Tester - Adapter -VAG1274/8-
- ◆ Cooling System Tester - Adapter -VAG1274/9-

### Test Conditions

- Engine at operating temperature.



## Test Sequence

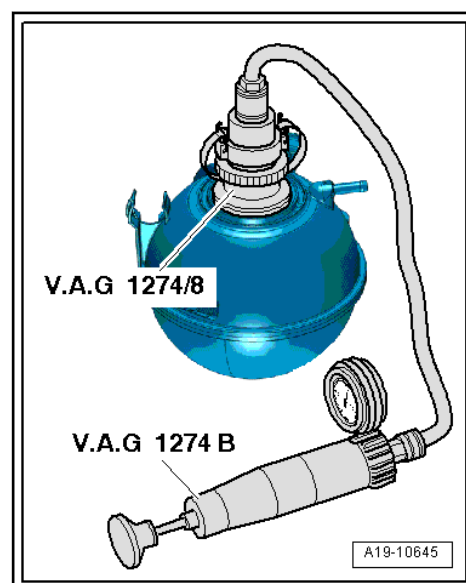
### WARNING

The cooling system is under pressure when the engine is warm. Risk of scalding due to hot steam and hot coolant.

Scalding the skin and other parts of the body is possible.

- Wear safety gloves.
- Wear protective eyewear.
- Reduce the pressure by covering the coolant expansion tank cap with a cloth and carefully opening it.

- Open the coolant expansion tank cap.
- Screw the Cooling System Tester - Adapter -VAG1274/8- into the coolant expansion tank.
- Clamp the Adapter -VAG1274B/1- in the Cooling System Tester - Adapter -VAG1274/8-.
- Connect the Adapter -VAG1274B/1- to the Cooling System Tester -VAG1274B- using the hose provided.



- Generate a positive pressure of approximately 1.0 bar (14.5 psi) using the hand pump of the Tester.

### WARNING

The cooling system is under pressure when the engine is warm. Risk of scalding due to hot steam and hot coolant.

Scalding the skin and other parts of the body is possible.

- Wear safety gloves.
- Wear protective eyewear.
- Reduce the pressure by covering the coolant expansion tank cap with a cloth and carefully opening it.

If the pressure drops:

- Search for leaking areas and repair the malfunction.

## Pressure Relief Valve in Cap, Checking

- Install the cap in the Cooling System Tester - Adapter - VAG1274/9-.



- Clamp the Adapter -VAG1274B/1- in the Cooling System Tester - Adapter -VAG1274/9-.
- Connect the Adapter -VAG1274B/1- to the Cooling System Tester -VAG1274B- using the hose provided.
- Operate the hand pump.
- The pressure release valve must open at 1.4 to 1.6 bar (20.30 to 23.20 psi).

If the pressure relief valve opens too early or too late:

- Replace the cover.

### 1.3 Coolant, Draining and Filling

#### Special tools and workshop equipment required

- ◆ Refractometer -T10007A-
- ◆ Drip Tray for VAG1202A -VAG1306- or Shop Crane - Drip Tray -VAS6208-
- ◆ Spring Clip Pliers
- ◆ Cooling System Charge Kit -VAS6096-
- ◆ Cooling System Tester - Adapter -VAG1274/8-
- ◆ Coolant additive -G 12 plus-plus-

#### Draining



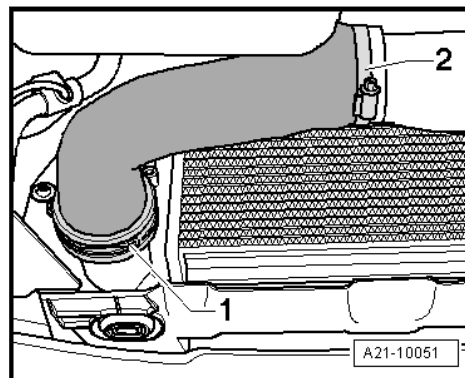
#### WARNING

The cooling system is under pressure when the engine is warm. Risk of scalding due to hot steam and hot coolant.

Scalding the skin and other parts of the body is possible.

- Wear safety gloves.
- Wear protective eyewear.
- Reduce the pressure by covering the coolant expansion tank cap with a cloth and carefully opening it.

- Open the coolant expansion tank cap.
- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50; Noise Insulation.
- Disconnect the charge air hose by lifting the clamps -1- and loosening the hose clamp -2-.

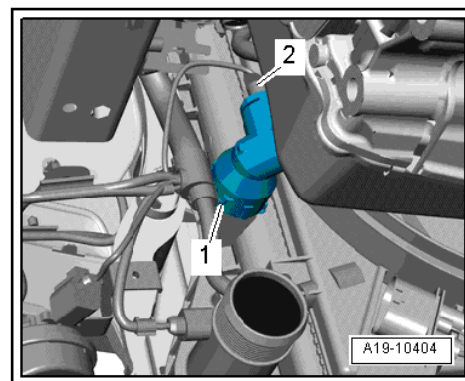


- Seal off the connections on the charge air cooler with a clean cloth.

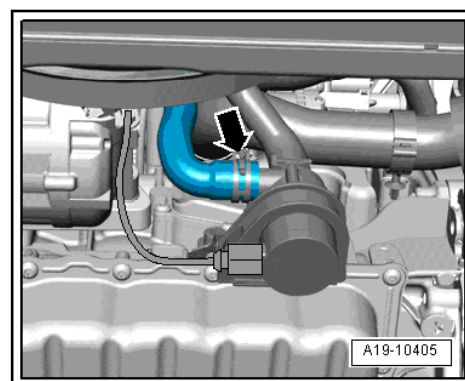
**Note**

*Drained coolant must be stored in a clean container for disposal or reuse.*

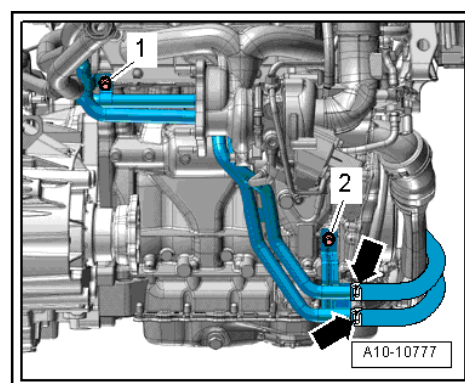
- Place a Drip Tray for VAG1202A -VAG1306- or Shop Crane - Drip Tray -VAS6208- under the engine.
- Remove the lower coolant hose -1- from the radiator and let the coolant drain.



- Remove the lower coolant hose to the After-Run Coolant Pump -V51- -arrow- and allow the coolant to drain.

**Vehicles with Parking Heater**

- Remove the coolant hoses -arrows- and let the remaining coolant drain.





## Filling



### Note

- ◆ *The mixture of the water used greatly influences the effectiveness of the coolant.*
- ◆ *Volkswagen has decided to define the water quality used in the cooling system based on the different mixtures and country and regional requirements.*
- ◆ *Distilled water fulfills all requirements.*
- ◆ *For this reason, we recommend using distilled water for older models when adding coolant or filling coolant for the first time.*



### Note

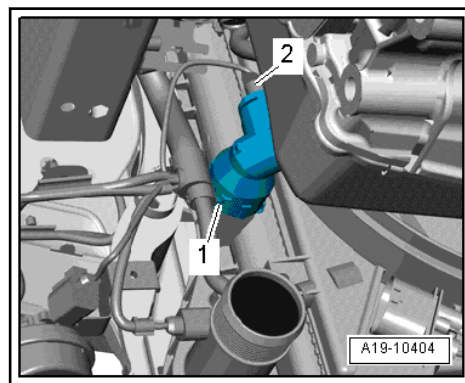
- ◆ *Only use -G 12 Plus Plus- Coolant Additive that conforms to TL VW 774 G.*
- ◆ *Coolant additives with the note "conforming to TL VW 774 G" prevent frost and corrosion damage, scaling and also raise the boiling temperature. The cooling system must be filled with coolant additive year-round.*
- ◆ *Because of its high boiling point, the coolant contributes to engine reliability under heavy engine loads, particularly in countries with tropical climates.*
- ◆ *Freeze protection must be guaranteed to be up to about -25 °C (-13 °F) (in countries with arctic climates: to about -35 °C (-31 °F)).*
- ◆ *The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. The coolant additive portion must be at least 40%.*
- ◆ *If more freeze protection is needed due to the climate, increase the amount of Coolant Additive, but only up to 60% (freeze protection down to -40 °C (-40 °F)). Otherwise the freeze protection and cooling effectiveness will be reduced.*
- ◆ *The Refractometer -T10007-is recommended for determining the current anti-freeze density.*
- ◆ *Do not use the old coolant again if replacing the radiator, heater core, cylinder head or cylinder head gasket.*

## Recommended Mixture Ratios

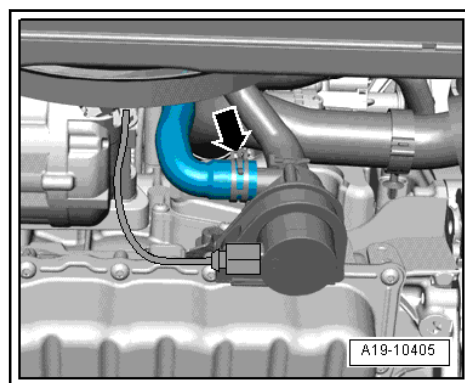
| Frost Protection to | Anti-Freeze | - G 12 plus-plus- 1)    | Distilled Water <sup>1)</sup> |
|---------------------|-------------|-------------------------|-------------------------------|
| -25 °C (-13 °F)     | 40%         | 3.2 liters (3.3 quarts) | 4.8 liters (5 qts)            |
| -35 °C (-31 °F)     | 50%         | 4.0 liters (4.2 quarts) | 4.0 liters (4.2 quarts)       |

<sup>1)</sup> The amount of coolant may vary depending on vehicle equipment.

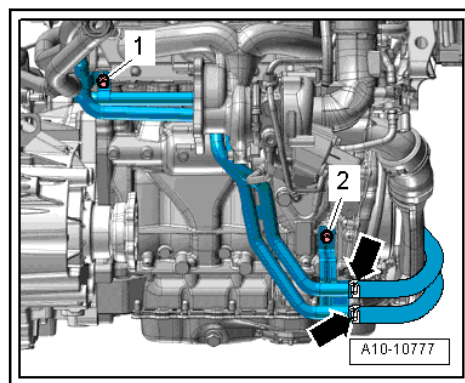
- Connect the lower coolant hose -1- to the radiator.



- Connect the coolant hose to the After-Run Coolant Pump -V51- -arrow-.

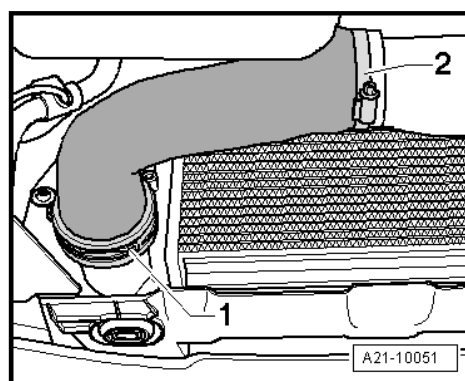


#### Vehicles with Parking Heater



- Connect the coolant hoses -arrows-.

#### Continuation for All Vehicles



- Install the charge air hose -1 and 2-.



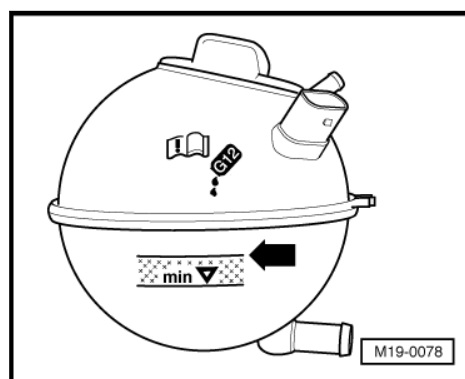
- Install the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50; Noise Insulation.

#### With Cooling System Charge Kit -VAS6096-

- Install the Cooling System Tester - Adapter -VAG1274/8- on the expansion tank.
- Fill the coolant circuit using the Cooling System Charge Kit -VAS6096-. Refer to the Cooling System Filler Unit VAS6096 Operating Instructions.

#### Without Cooling System Charge Kit -VAS6096-

- Slowly add coolant up to the upper mark -arrow- of the incremented area on the expansion tank.



- Close the reservoir.
- Switch off the heating and A/C system.
- Start the engine and maintain an engine speed of approximately 2000 RPM for about 3 minutes.
- Allow engine to run until Radiator Fan -V7- turns on.

#### WARNING

The cooling system is under pressure when the engine is warm. Risk of scalding due to hot steam and hot coolant. Scalding the skin and other parts of the body is possible.

- Wear safety gloves.
  - Wear protective eyewear.
  - Reduce the pressure by covering the coolant expansion tank cap with a cloth and carefully opening it.
- 
- Check the coolant level when the expansion tank is closed and, if necessary, add any missing coolant when the engine is cool.
  - With engine at operating temperature, coolant level must lie at top marking of hatched area -arrow-.
  - When the engine is cold, the coolant level should be close to the center of the incremented area.





## 2 Coolant Pump/Coolant Thermostat

- ⇒ [-2.1 Coolant Pump/Coolant Thermostat", page 231](#)
- ⇒ [-2.2 Electric Coolant Pump", page 233](#)
- ⇒ [C2.3 Coolant Pump, Removing and Installing", page 234](#)
- ⇒ [P2.4 Pump, Removing and Installing", page 235](#)
- ⇒ [T2.5 Thermostat, Removing and Installing", page 237](#)
- ⇒ [P2.6 Pump Toothed Belt, Removing and Installing", page 241](#)
- ⇒ [P2.7 Pump Drive Gear Sealing Ring, Replacing", page 243](#)
- ⇒ [E2.8 Engine Coolant Temperature Sensor G62, Removing and Installing", page 245](#)

### 2.1 Overview - Coolant Pump/Coolant Thermostat

**1 - Bolt**

- ☐ Tightening sequence and specification. Refer to ➤ [Fig. "Coolant Pump Tightening Sequence and Tightening Specification", page 233](#).

**2 - O-Ring**

- ☐ Replace after removing
- ☐ Coat with coolant

**3 - Connection****4 - Clip**

- ☐ Only with the attached version
- ☐ Check for secure fit

**5 - Bolt**

- ☐ 4 Nm
- ☐ Only with the bolted version

**6 - Baseplate**

- ☐ Only with the bolted version

**7 - Engine Coolant Temperature Sensor -G62-**

- ☐ Removing and installing. Refer to ➤ [E2.8 Engine Coolant Temperature Sensor G62, Removing and Installing", page 245](#).

**8 - O-Ring**

- ☐ Replace after removing

**9 - Coolant Pump**

- ☐ Removing and installing. Refer to ➤ [P2.4 ump, Removing and Installing", page 235](#).
- ☐ For a new coolant pump, remove the protective cap

**10 - Seal**

- ☐ Replace after removing

**11 - Centering Pin**

- ☐ Quantity: 2

**12 - Toothed Belt**

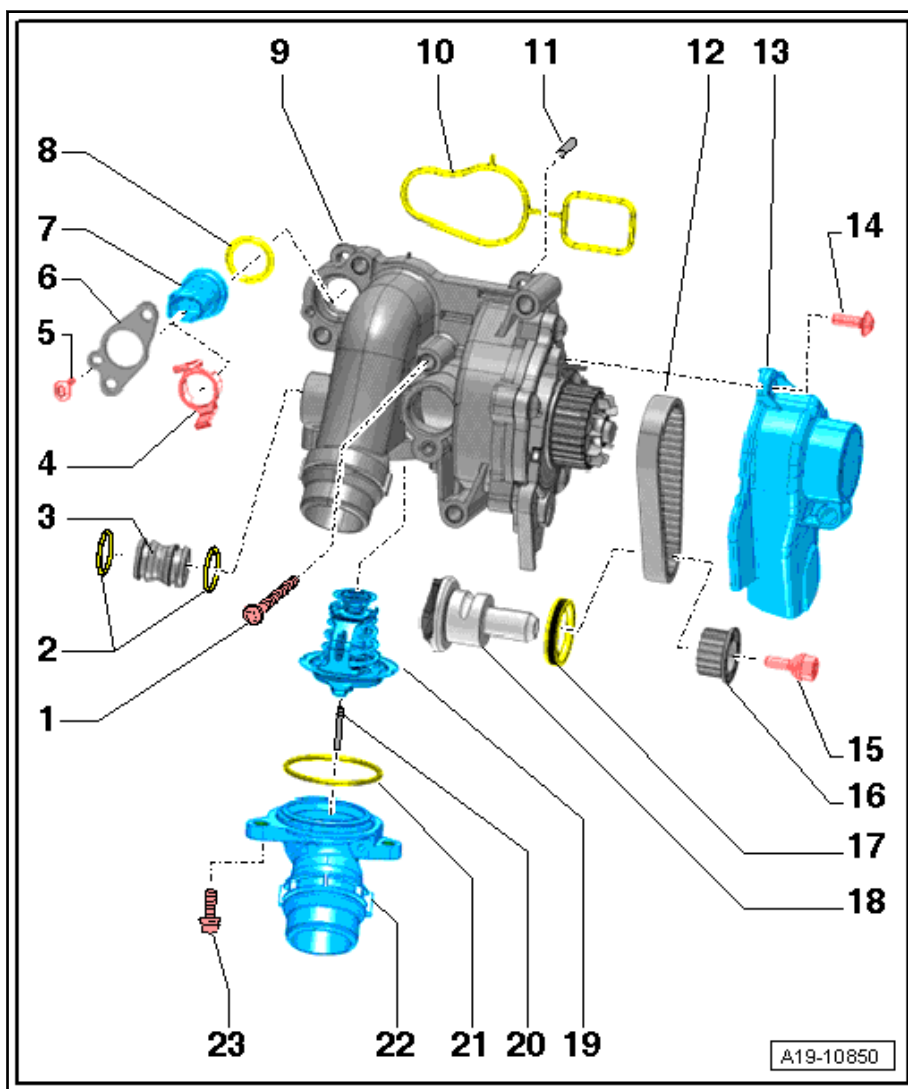
- ☐ For the coolant pump
- ☐ Removing and installing. Refer to ➤ [P2.6 ump Toothed Belt, Removing and Installing", page 241](#).

**13 - Toothed Belt Guard****14 - Bolt**

- ☐ 9 Nm

**15 - Bolt**

- ☐ 17 Nm
- ☐ Replace after removing
- ☐ Left-hand thread



**16 - Toothed Belt Sprocket**

- ☐ Note the installation position: the collar on the drive gear must face the transmission.

**17 - Seal**

- ☐ Replacing. Refer to [⇒ P2.7 ump Drive Gear Sealing Ring, Replacing](#), page 243 .

**18 - Balance Shaft****19 - Coolant Thermostat**

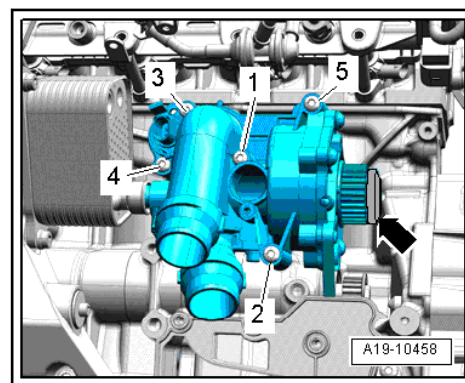
- ☐ The coolant thermostat can be checked in “Guided Fault Finding” under “Function and Component Selection”.
- ☐ Removing and installing. Refer to [⇒ T2.5 hermostat, Removing and Installing](#), page 237 .

**20 - Centering Pin****21 - O-Ring**

- ☐ Replace after removing

**22 - Connection****23 - Bolt**

- ☐ 9 Nm

**Coolant Pump Tightening Sequence and Tightening Specification**

- Tighten the coolant pump bolts in the sequence -1 to 5-.

| Bolts    | Tightening Specification |
|----------|--------------------------|
| -1 to 5- | 9 Nm                     |

**2.2 Overview - Electric Coolant Pump**



1 - Bracket

2 - Bolt

□ 40 Nm

3 - Coolant Hose

□ Coolant hose connection diagram. Refer to  
⇒ [D1.1 iagram - Coolant Hoses](#), page 223 .

4 - Coolant Hose

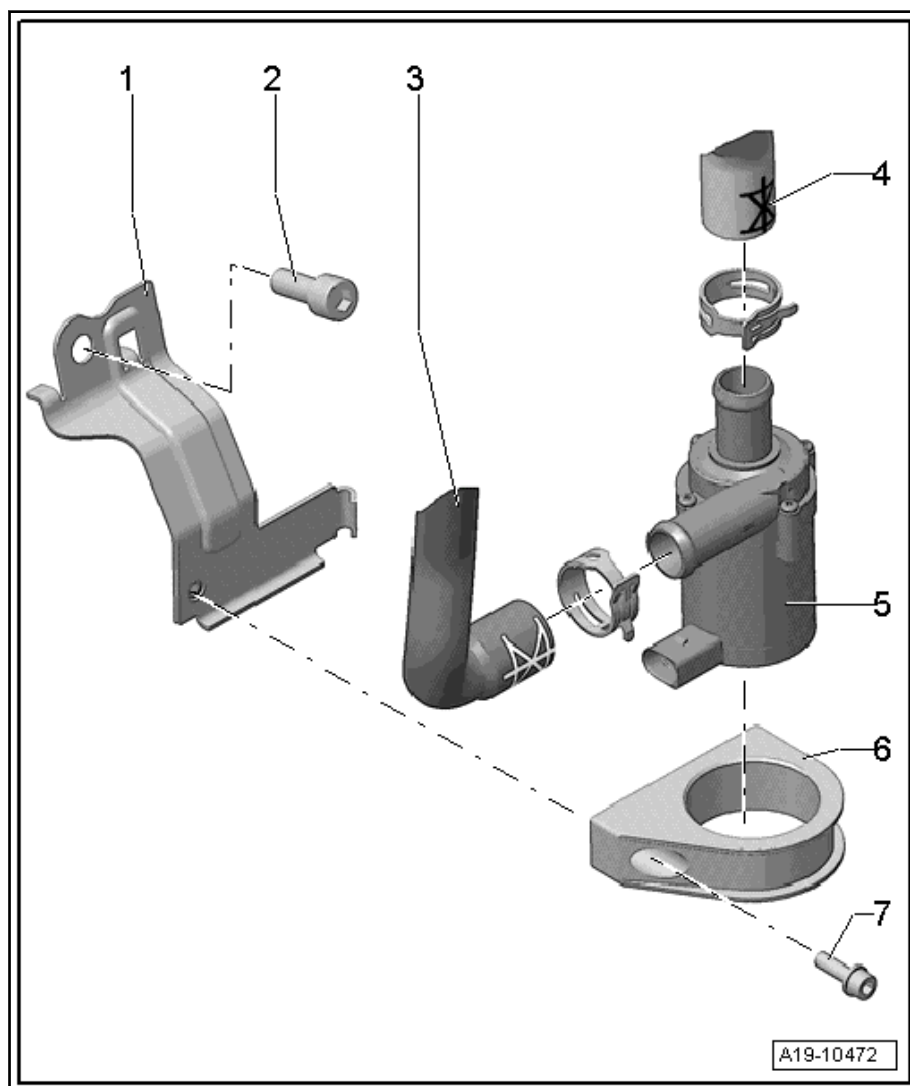
□ Coolant hose connection diagram. Refer to  
⇒ [D1.1 iagram - Coolant Hoses](#), page 223 .

5 - After-Run Coolant Pump  
-V51-

6 - Bracket

7 - Bolt

□ 8 Nm



## 2.3 Electric Coolant Pump, Removing and Installing

### Special tools and workshop equipment required

- ◆ Hose Clamps - Up To 25mm -3094-
- ◆ Spring Clip Pliers

### Removing



#### WARNING

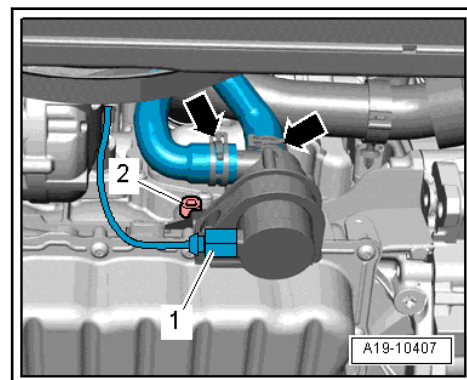
The cooling system is under pressure when the engine is warm. Risk of scalding due to hot steam and hot coolant. Scalding the skin and other parts of the body is possible.

- Wear safety gloves.
- Wear protective eyewear.
- Reduce the pressure by covering the coolant expansion tank cap with a cloth and carefully opening it.

- Open the coolant expansion tank cap.



- Remove the noise insulation. Refer to ➔ Body Exterior; Rep. Gr. 50; Noise Insulation.
- Disconnect the connector -1- for the After-Run Coolant Pump -V51-.



- Place a Drip Tray for VAG1202A -VAG1306- or Shop Crane - Drip Tray -VAS6208- under the engine.
- Clamp off the coolant hoses -arrows- with the Hose Clamps - Up To 25mm -3094-.
- Remove the coolant hoses from the After-Run Coolant Pump -V51-.
- Remove the bolt -2- and the After-Run Coolant Pump -V51-.

### Installing

Install in reverse order of removal. Note the following:

- Check the coolant level. Refer to ➔ [D1.3 raining and Filling](#), [page 226](#) .

### Tightening Specification

- ◆ Refer to ➔ [-2.2 Electric Coolant Pump](#), [page 233](#)

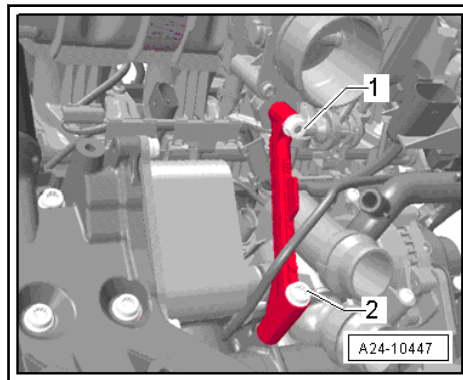
## 2.4 Coolant Pump, Removing and Installing

### Special tools and workshop equipment required

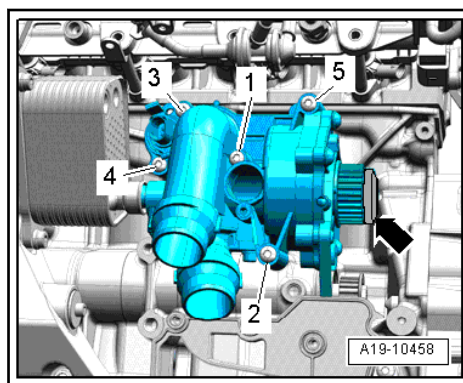
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Coolant Additive -G 12 plus-plus-

### Removing

- Remove the small coolant pipe. Refer to ➔ [C3.3 oolant Pipe, Removing and Installing](#), [page 253](#) .
- Remove the throttle valve control module. Refer to ➔ [T4.3 hrottle Valve Control Module J338, Removing and Installing](#), [page 327](#) .
- Remove the coolant pump toothed belt. Refer to ➔ [P2.6 ump Toothed Belt, Removing and Installing](#), [page 241](#) .
- Remove the nut -1- and bolt -2- and the intake manifold support.



- Remove the bonded rubber bushing for the intake manifold support on the intake manifold.
- Remove the Engine Coolant Temperature Sensor -G62-.  
Inserted version. Refer to ➤ [page 247](#) .  
Threaded version. Refer to ➤ [page 247](#) .
- Remove the bolts -5 through 1-.
- Remove the coolant pump from the centering pin and disconnect it from the engine oil cooler.



### Installing

Install in reverse order of removal. Note the following:



#### Note

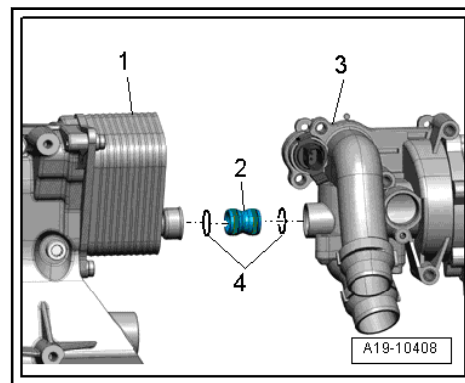
*Replace the seals and O-rings.*



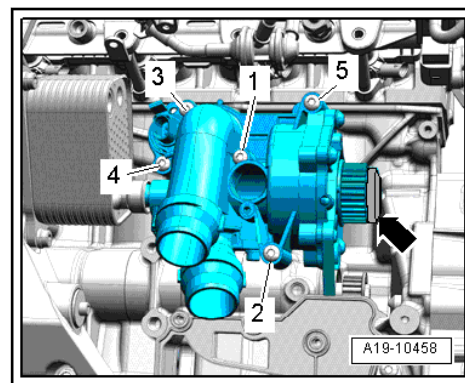
#### NOTICE

**When replacing the coolant pump, ensure the seal, sealing surface and surrounding engine area are free from oils that may contaminate the seal and cause a repeat concern.**

- Clean the sealing surface for the O-rings.
- Coat the O-rings -4- with Coolant Additive -G 12 plus-plus-.



- Make sure that both centering pins are installed in the cylinder block if necessary insert.
- Install the connection pieces -2- into the engine oil cooler -1-.
- First slide the coolant pump -3- onto the connecting piece and then place on the centering pins in the cylinder block.
- Using a mirror, check if the coolant pump is »seated« correctly on the centering pins.
- Tighten the bolt in the following sequence: -1 to 5-.



### Note

*If a new coolant pump is installed, the protective cap -arrow- must be removed.*

The rest of the installation follows the reverse of the removal procedures.

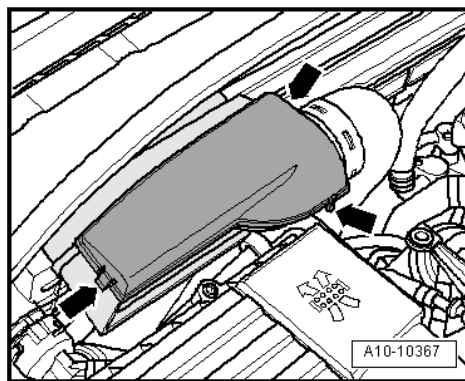
## 2.5 Coolant Thermostat, Removing and Installing

### Special tools and workshop equipment required

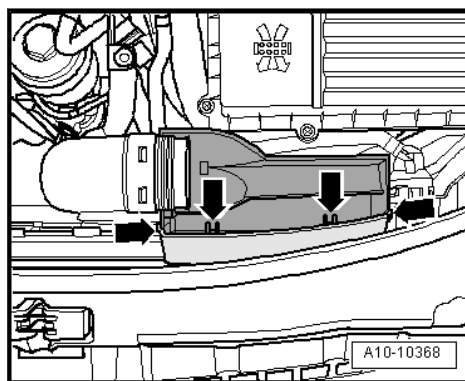
- ◆ Hex Ball Socket -T10058-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Coolant Additive -G 12 plus-plus-

### Removing

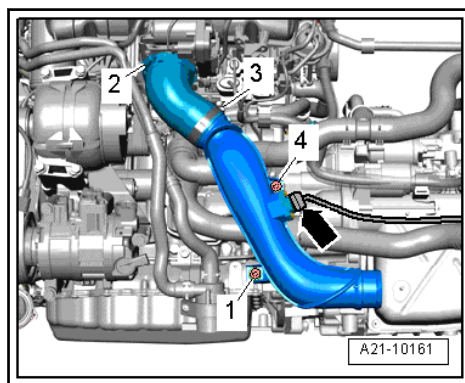
- Drain the coolant. Refer to [⇒ D1.3 draining and Filling”, page 226](#) .
- Disengage the side clips -arrows- and remove the cover for the air duct.



- Disengage the wire retainers -arrows- to unclip the lower air duct.

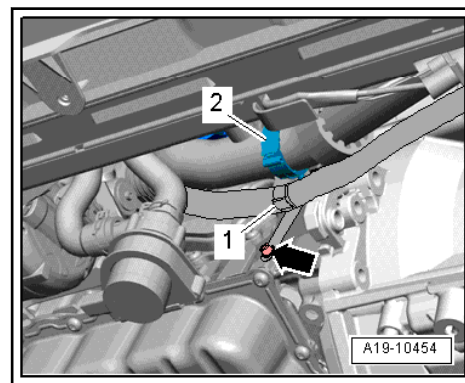


- Remove the lower air duct with the air duct hose.
- If equipped, remove the charge air guide to the sound generator.
- Loosen the hose clamp -2-.

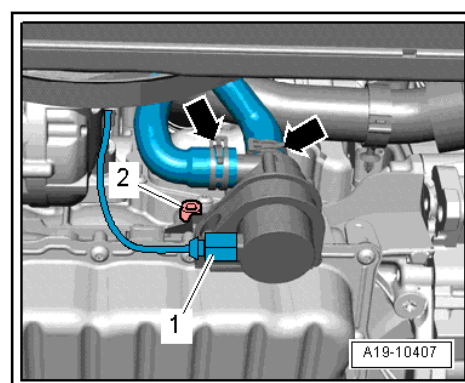


- Remove the bolt -4-.
- Disconnect the connector -arrow-.
- Remove the bolt -1- and remove the air duct pipe downward.
- Free up the coolant hose -2- and the wiring harness -1-.



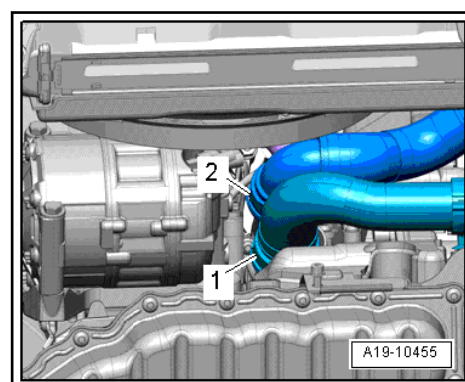


- Remove the bolt -arrow- and remove bracket.
- Remove the bolt -2- on the bracket for the After-Run Coolant Pump -V51-.

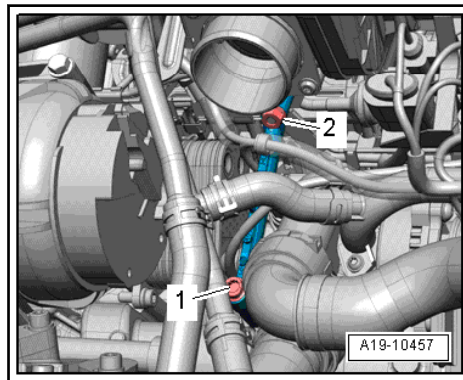
**Note**

*The After-Run Coolant Pump -V51- stays in the installation position.*

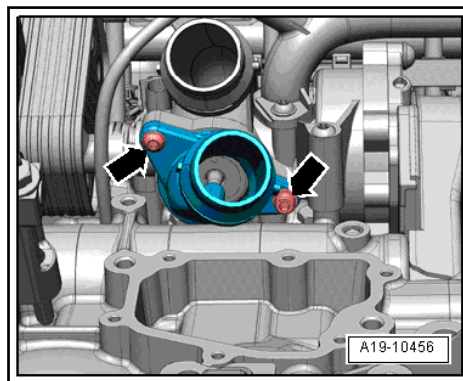
- Remove the coolant hoses -1 and 2- and lay them aside.



- Loosen the nut -2- and remove the bolt -1-. Tilt the intake manifold support slightly to the right.



- Remove the oil separator. Refer to [⇒ S2.1 eparator, Removing and Installing](#), page 205 .
- Remove bolts -arrows- and remove connecting pieces. For the right bolt, the Hex Ball Socket -T10058- is useful.

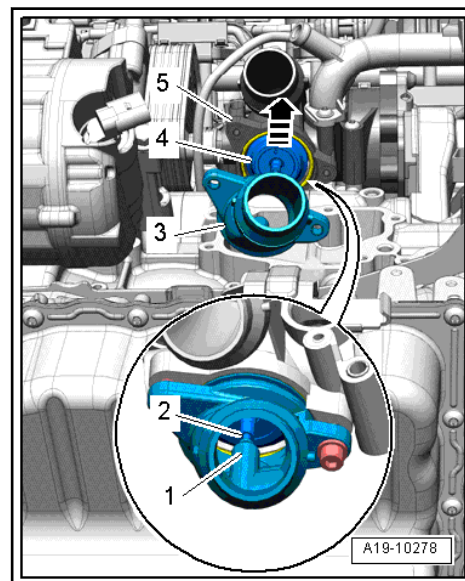


- Remove the coolant thermostat.

### Installing

Install in reverse order of removal. Note the following:

- Replace the seals and O-rings.
- Clean the sealing surface on the O-ring.
- Coat the O-ring with Coolant Additive -G 12 plus-plus-.
- Install the thermostat -4- into the housing -5- for the coolant pump and move it slightly forward in direction of -arrow-.



- Carefully mount the connector -3-, while doing so, insert the centering pin -2- into the guide -1-.

#### Tightening Specification

- ◆ Refer to [⇒ -3.1 Air Filter Housing”, page 310](#)
- ◆ Refer to [⇒ -2.2 Electric Coolant Pump”, page 233](#)
- ◆ Refer to [⇒ -2.1 Coolant Pump/Coolant Thermostat”, page 231](#)

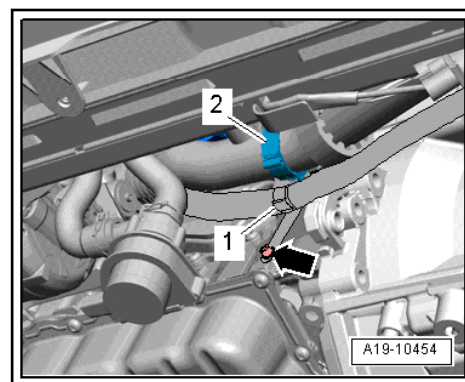
## 2.6 Coolant Pump Toothed Belt, Removing and Installing

#### Special tools and workshop equipment required

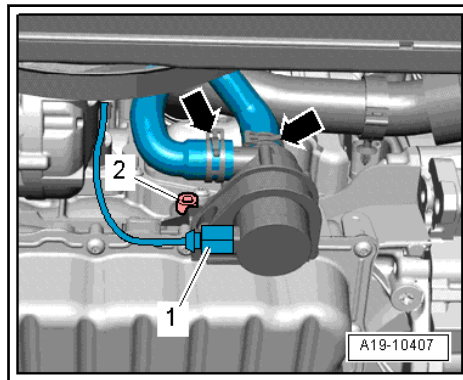
- ◆ Torque Wrench 1331 Insert - Ring Wrench - 12mm -T10360-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-

#### Removing

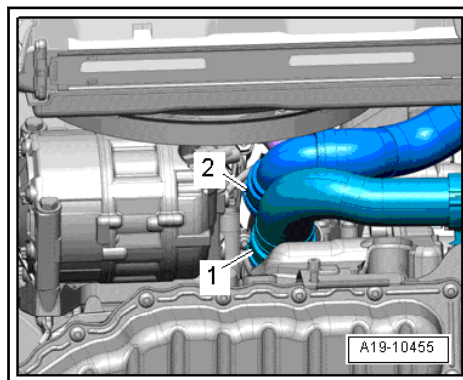
- Remove the small coolant pipe. Refer to [⇒ C3.3 Coolant Pipe, Removing and Installing”, page 253](#).
- Free up the coolant hose -2- and the wiring harness -1-.



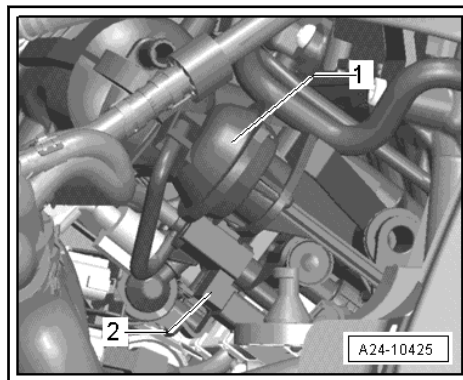
- Remove the bolt -arrow- and remove bracket.
- Remove the bolt -2- on the bracket for the After-Run Coolant Pump -V51-.



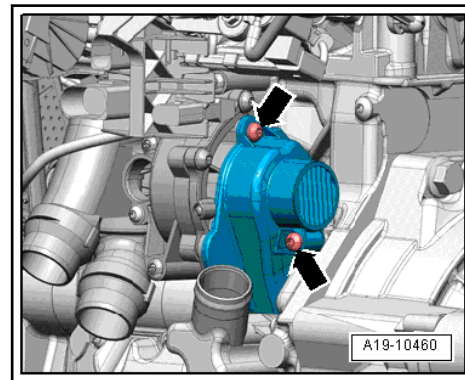
- Remove the coolant hoses -1 and 2- and lay them aside.



- Remove the Intake Manifold Runner Control Valve -N316-2- and set it aside.

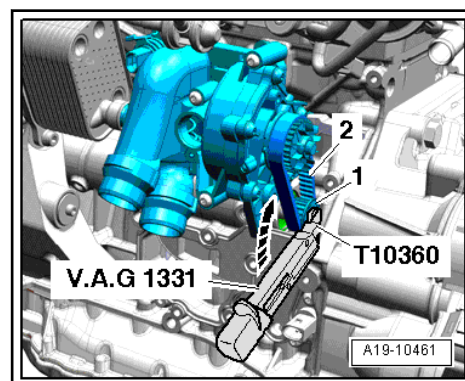


- Free up the wiring harness, pull it upward and secure it with cable ties.
- Remove the bolts -arrows- and remove the toothed belt guard.

**Note**

*The drive gear bolt has a left-hand thread.*

- Remove the bolt on the coolant pump drive wheel -1- clockwise using the Torque Wrench 1331 5-50Nm -VAG1331- and Torque Wrench 1331 Insert - Ring Wrench - 12mm -T10360-. Counterhold the top of the vibration damper with a 24 mm socket when doing this.
- Remove the drive gear -1- and toothed belt -2-.

**Installing**

Install in reverse order of removal. Note the following:

- Replace the drive gear bolt.
- Replace the seals and O-rings.

Pay attention to the installation position of the drive gear:

- The collar on the drive gear faces the transmission.

**Tightening Specification**

- ◆ Refer to ⇒ [-2.2 Electric Coolant Pump", page 233](#)
- ◆ Refer to ⇒ [-2.1 Coolant Pump/Coolant Thermostat", page 231](#)

## 2.7 Coolant Pump Drive Gear Sealing Ring, Replacing

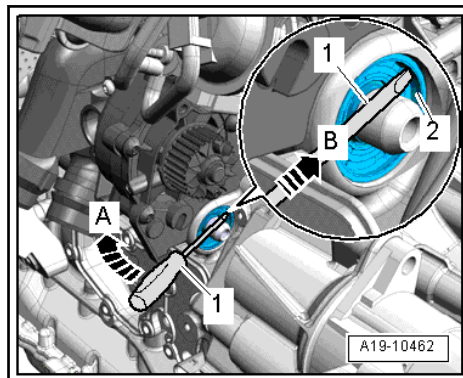
**Special tools and workshop equipment required**

- ◆ Seal Installer - Intermediate Shaft -T10353-



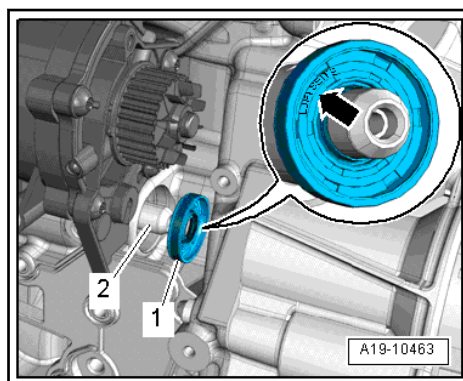
## Removing

- Remove the coolant pump toothed belt. Refer to ➤ [P2.6 ump Toothed Belt, Removing and Installing](#), page 241 .
- Firmly press a screwdriver -1- on the surface of the sealing ring -2- in direction of -arrow B-.
- Pry out the sealing ring in direction of -arrow A-.

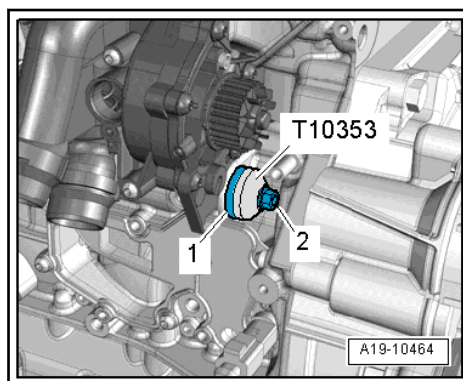


## Installing

- Clean the contact and sealing surface.
- Coat the sealing surface of the balance shaft -2- with engine oil.



- Push the sealing ring -1- onto the balance shaft.
- “Luftseite” or (“Outside”) -arrow- must be readable from the outside.
- Mount the Seal Installer - Intermediate Shaft -T10353- on the seal -1- and press it into the cylinder block all the way with the bolt -2-. Do not bend the seal when doing this.





The rest of the installation follows the reverse of the removal procedures.

## 2.8 Engine Coolant Temperature Sensor - G62-, Removing and Installing

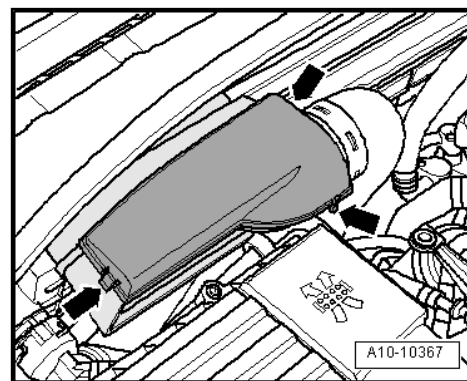
**Special tools and workshop equipment required**

- ◆ Torque Wrench 1331 5-50Nm -VAG1331-

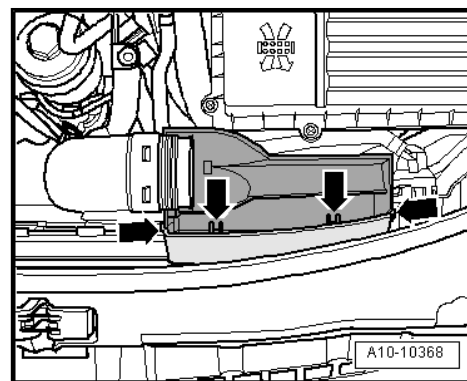
### Removing

#### Conditions

- The engine is cold.
- Disengage the side clips -arrows- and remove the cover for the air duct.

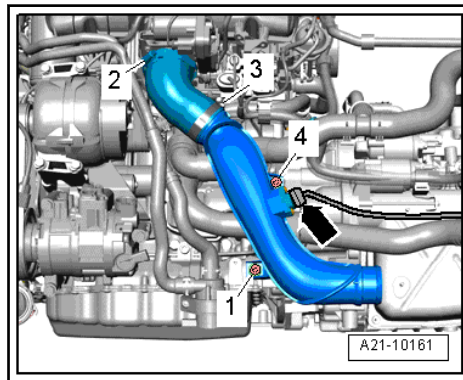


- Disengage the wire retainers -arrows- to unclip the lower air duct.

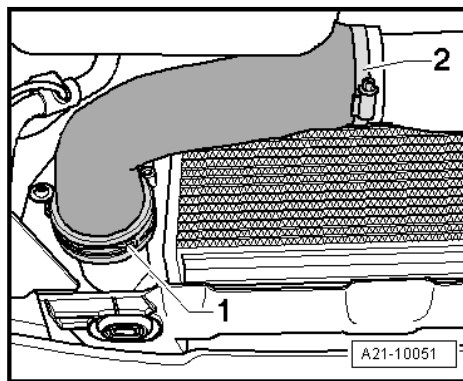


- Remove the lower air duct with the air duct hose.
- If equipped, remove the charge air guide to the sound generator.
- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50; Noise Insulation.
- Loosen the hose clamp -2-.

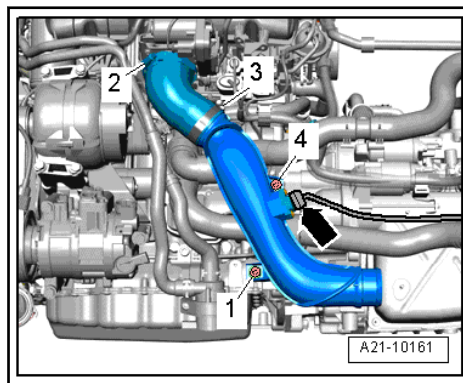




- Remove the bolt -4-.
- Disconnect the connector -arrow-.
- Disconnect the charge air hose by lifting the clamps -1- and loosening the hose clamp -2-.

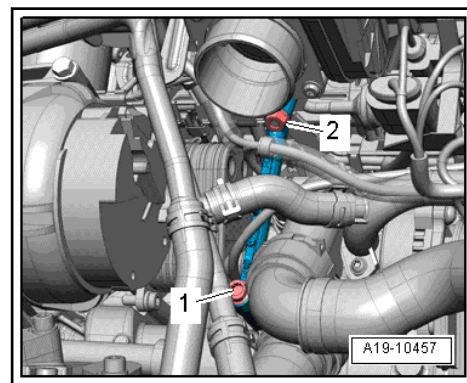


- Seal off the connections on the charge air cooler with a clean cloth.
- Remove the bolt -1- and remove the air duct pipe downward.

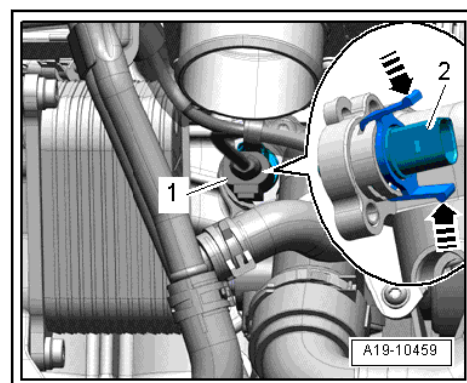


- Remove the throttle valve control module. Refer to [T4.3 Throttle Valve Control Module J338, Removing and Installing](#), page 327 .
- Remove the intake manifold support by removing the nut -2- and bolt -1-.





### Engine Coolant Temperature Sensor -G62- with Clip



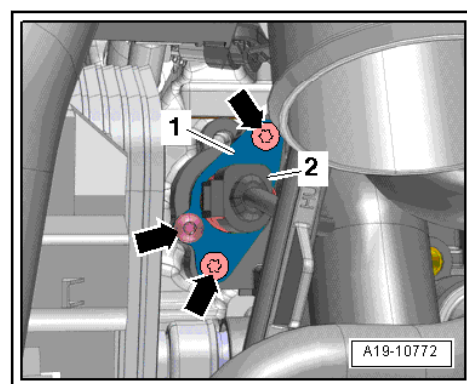
- Disconnect the connector -1- on the Engine Coolant Temperature Sensor -G62-.
- Press the locking mechanisms -arrows- and remove the clip.
- Remove the Engine Coolant Temperature Sensor -G62- -2-.



### Note

*To prevent a lot of coolant loss, immediately insert the new Engine Coolant Temperature Sensor -G62- with an O-ring in the connection.*

### Engine Coolant Temperature Sensor -G62- with retaining plate:



- Disconnect the connector -2- on the Engine Coolant Temperature Sensor -G62-.
- Remove the bolts -arrows- and remove the retaining plate -1-.
- Remove the Engine Coolant Temperature Sensor -G62-.



**Note**

*To prevent a lot of coolant loss, immediately insert the new Engine Coolant Temperature Sensor -G62- with an O-ring in the connection.*

**Installing**

Install in reverse order of removal. Note the following:



**Note**

*Replace the O-ring.*

- Clean the sealing surface on the O-ring.
- Check the coolant level. Refer to [⇒ D1.3 draining and Filling", page 226](#).

**Tightening Specification**

- ◆ Refer to [⇒ -2.1 Coolant Pump/Coolant Thermostat", page 231](#)
- ◆ Refer to [⇒ -4.1 Intake Manifold", page 316](#)



### 3 Coolant Pipes

⇒ [3.1 Coolant Pipes](#), page 249

⇒ [C3.2 Coolant Pipes, Removing and Installing](#), page 250

⇒ [C3.3 Coolant Pipe, Removing and Installing](#), page 253

#### 3.1 Overview - Coolant Pipes



##### Note

- ◆ Install only approved clamps for securing hose connections. Refer to Parts Catalog.
- ◆ The arrows on coolant pipes and the coolant hose ends must align when installing.

Coolant hose connection diagram. Refer to ⇒ [D1.1 Diagram - Coolant Hoses](#), page 223.

##### 1 - Front Coolant Pipes

- Removing and installing. Refer to ⇒ [C3.2 Coolant Pipes, Removing and Installing](#), page 250.

##### 2 - Coolant Hose

- From the Turbocharger

##### 3 - Coolant Hose

- To coolant expansion tank

##### 4 - Bolt

- 5 Nm

##### 5 - O-Ring

- Replace after removing

##### 6 - Coolant Hose

- To heater core

##### 7 - Small Coolant Pipe

- Removing and installing. Refer to ⇒ [C3.3 Coolant Pipe, Removing and Installing](#), page 253.

##### 8 - Bolts

- 9 Nm

##### 9 - Coolant Hose

##### 10 - Bolt

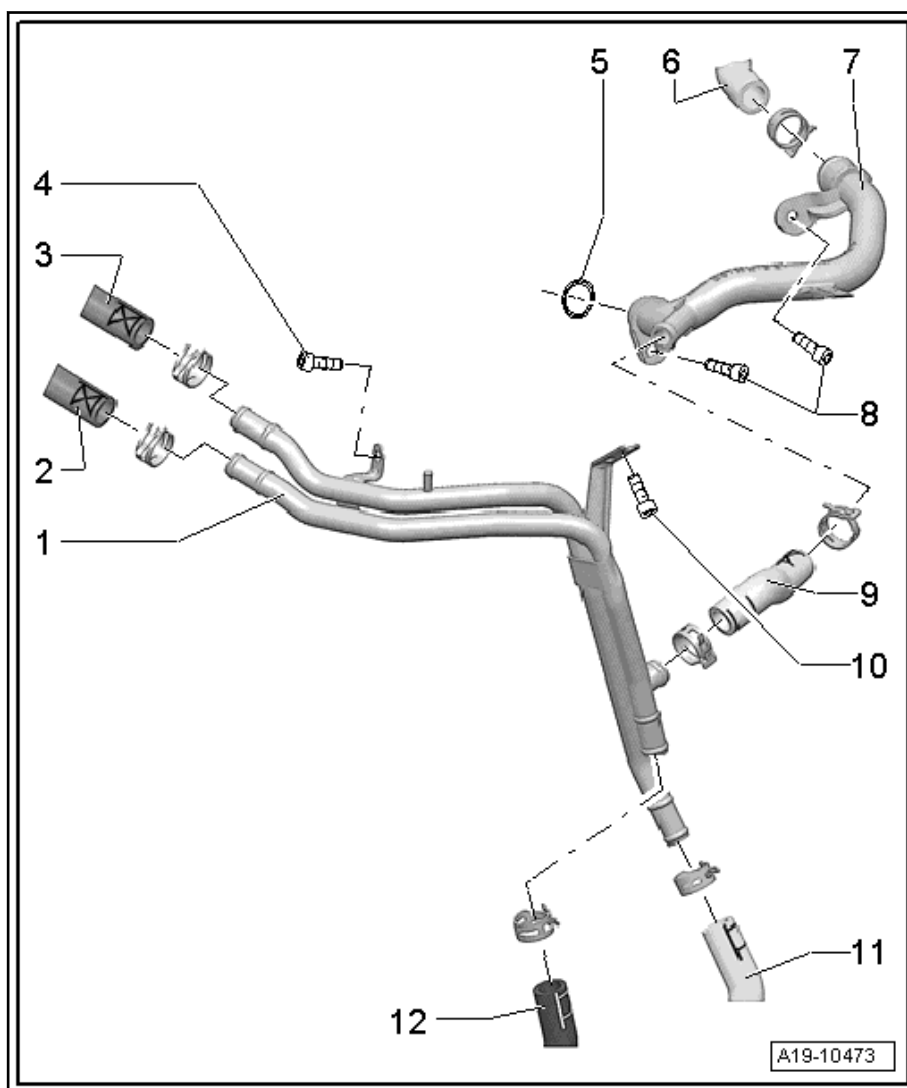
- 5 Nm

##### 11 - Coolant Hose

- From the After-Run Coolant Pump -V51-

##### 12 - Coolant Hose

- To the After-Run Coolant Pump -V51-





## 3.2 Front Coolant Pipes, Removing and Installing

### Special tools and workshop equipment required

- ◆ Torque Wrench 1783 - 2-10Nm -VAG1783-
- ◆ Drip Tray for VAG1202A -VAG1306- or Shop Crane - Drip Tray -VAS6208-
- ◆ Spring Clip Pliers -VAS6362-
- ◆ Coolant additive -G 12 plus-plus-

### Removing



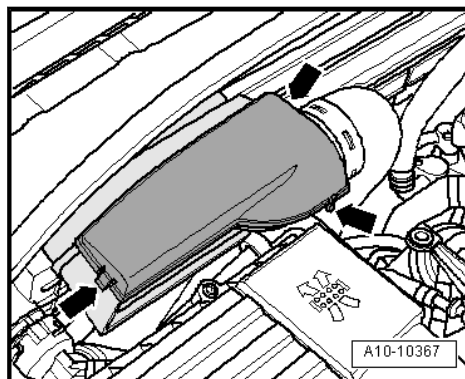
#### WARNING

The cooling system is under pressure when the engine is warm. Risk of scalding due to hot steam and hot coolant.

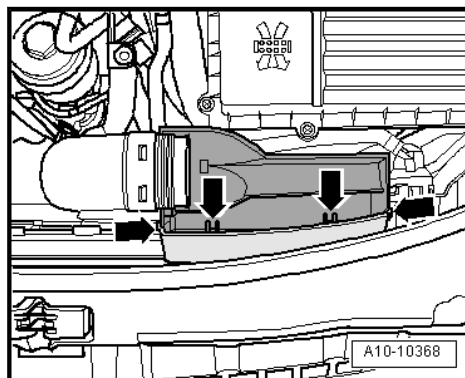
Scalding the skin and other parts of the body is possible.

- Wear safety gloves.
- Wear protective eyewear.
- Reduce the pressure by covering the coolant expansion tank cap with a cloth and carefully opening it.

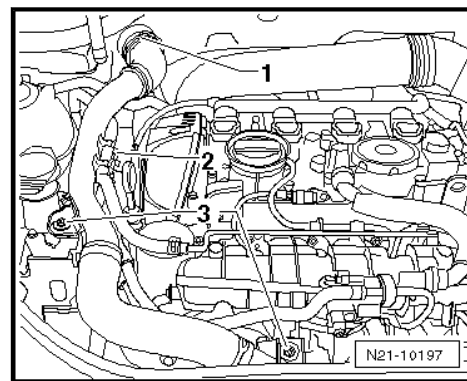
- Open the coolant expansion tank cap.
- Disengage the side clips -arrows- and remove the cover for the air duct.



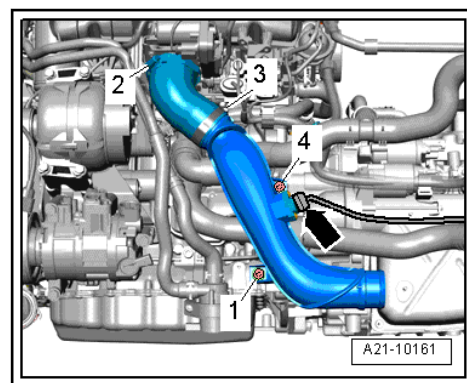
- Disengage the wire retainers -arrows- to unclip the lower air duct.



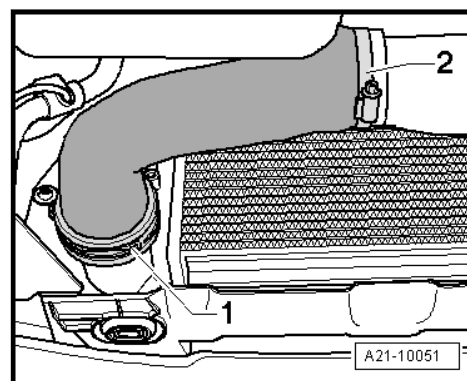
- Remove the lower air duct with the air duct hose.
- Vehicles with sound generator: open the locking mechanism -1-, unclip the fuel lines -2- and loosen the bolt -3- on the EVAP canister. Move the charge air pipe aside.



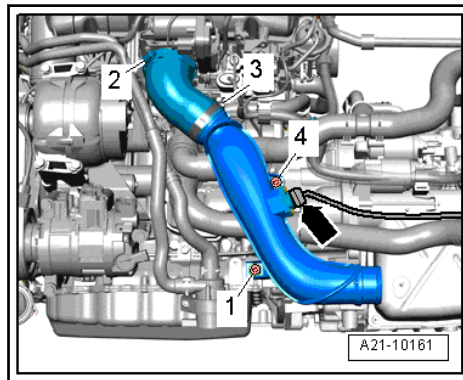
- Loosen the hose clamp -2-.



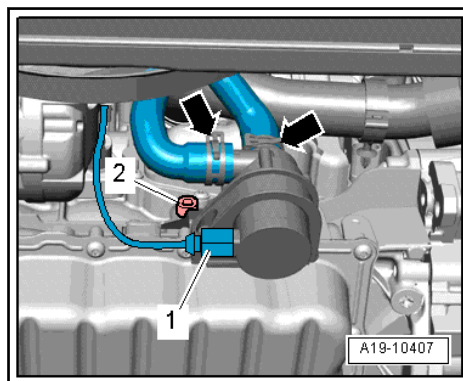
- Remove the bolt -4-.
- Disconnect the connector -arrow- and free up the wire.
- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50; Noise Insulation.
- Disconnect the charge air hose by lifting the clamps -1- and loosening the hose clamp -2-.



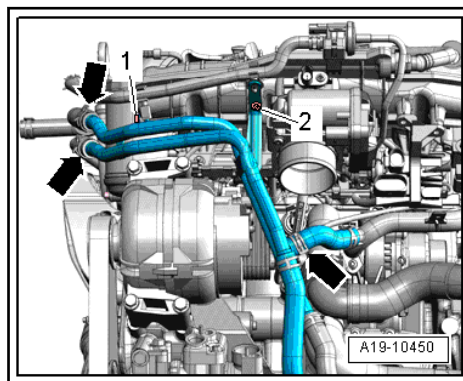
- Seal off the connections on the charge air cooler with a clean cloth.
- Remove the bolt -1- and remove the air duct pipe downward.



- Place a Drip Tray for VAG1202A -VAG1306- or Shop Crane - Drip Tray -VAS6208- under the engine.



- Remove the coolant hoses from the After-Run Coolant Pump -V51- -arrows-.
- Remove the bolts -1 and 2- and remove the front coolant pipes from the coolant hoses -arrows-.



## Installing

Install in reverse order of removal. Note the following:

- ♦ Install only approved clamps for securing hose connections. Refer to Parts Catalog.
- Install the air ducts with connector coupling. Refer to ⇒ [page 286](#) .
- Check the coolant level. Refer to ⇒ [D1.3 raining and Filling](#)”, [page 226](#) .

## Tightening Specification

- ♦ Refer to ⇒ [-2.2 Charge Air System](#)”, [page 283](#)



- ◆ Refer to ⇒ [-3.1 Coolant Pipes”, page 249](#)

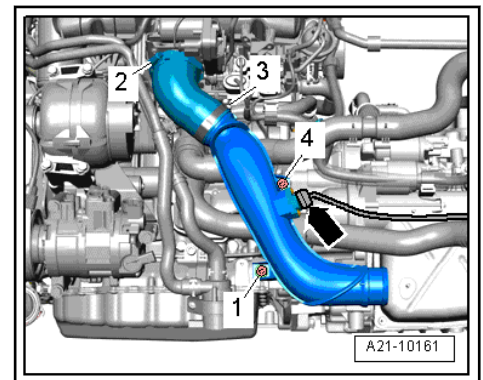
### 3.3 Small Coolant Pipe, Removing and Installing

#### Special tools and workshop equipment required

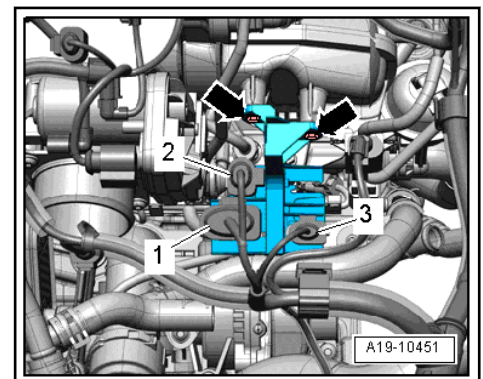
- ◆ Torque Wrench 1783 - 2-10Nm -VAG1783-
- ◆ Drip Tray for VAG1202A -VAG1306- or Shop Crane - Drip Tray -VAS6208-
- ◆ Spring Clip Pliers -VAS6362-
- ◆ Coolant additive -G 12 plus-plus-

#### Removing

- Drain the coolant. Refer to ⇒ [D1.3 draining and Filling”, page 226](#) .
- Remove the air filter. Refer to ⇒ [F3.2 filter Housing, Removing and Installing”, page 312](#) .
- If equipped, remove the charge air guide to the sound generator.
- Loosen the hose clamp -2-.



- Remove the bolt -4-.
- Disconnect the connector -arrow-.
- Remove the bolt -1- and remove the air duct pipe downward.
- Remove the bolts -arrows- and remove the electrical connectors -1 through 3- from the bracket.

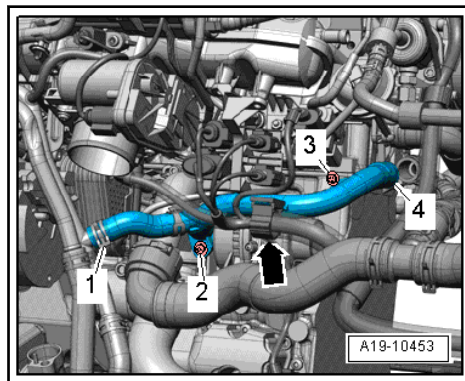


- Free up the wiring harness on the small coolant pipe -arrow-.
- Remove the bolts -2 and 3-.





- Disconnect the small coolant pipe from the coolant pump and from the coolant hoses -1 and 4-



### Installing

Install in reverse order of removal. Note the following:



#### Note

- ◆ *Replace the O-ring.*
- ◆ *Install only approved clamps for securing hose connections. Refer to Parts Catalog.*
- Install the air ducts with connector coupling. Refer to ⇒ [page 286](#) .
- Check the coolant level. Refer to ⇒ [D1.3 raining and Filling](#)”, [page 226](#) .

### Tightening Specification

- ◆ Refer to ⇒ [-2.2 Charge Air System](#)”, [page 283](#)
- ◆ Refer to ⇒ [-3.1 Coolant Pipes](#)”, [page 249](#)





## 4 Radiator/Radiator Fan

⇒ [4.1 Radiator/Radiator Fan", page 255](#)

⇒ [R4.2 emoving and Installing", page 257](#)

⇒ [S4.3 hroud with Radiator Fan, Removing and Installing", page 259](#)

⇒ [R4.4 adiator Fan V7 and Radiator Fan 2V177, Removing and Installing", page 261](#)

### 4.1 Overview - Radiator/Radiator Fan



# 1 - Radiator Fan -V7-

- ☐ Removing and installing. Refer to ➤ [R4.4 radiator Fan V7 and Radiator Fan 2V177, Removing and Installing](#), page 261 .

## 2 - Nut

- ☐ 10 Nm

## 3 - Fan Shroud

- ☐ Removing and installing. Refer to ➤ [S4.3 hroud with Radiator Fan, Removing and Installing](#), page 259 .

## 4 - Lower Coolant Hose

- ☐ To the connection for the coolant thermostat

## 5 - Clip

- ☐ Check for secure fit

## 6 - Engine Coolant Temperature Sensor on Radiator Outlet -G83-

- ☐ Replace the O-ring

## 7 - O-Ring

- ☐ Replace if damaged

## 8 - Upper Coolant Hose

- ☐ From the coolant pump

## 9 - O-Ring

- ☐ Replace if damaged

## 10 - Bolt

- ☐ 5 Nm
- ☐ On the charge air cooler

## 11 - Radiator

- ☐ Removing and installing. Refer to ➤ [R4.2 removing and Installing](#), page 257 .
- ☐ After replacing replace entire amount of coolant ➤ [D1.3 draining and Filling](#), page 226
- ☐ Engine code CBFA: with Radiator Identification Sensor -G611-. Refer to ➤ [Fig. "“ Radiator Identification Sensor -G611- \(Engine Code CBFA\)“"](#), page 256 .

## 12 - Nut

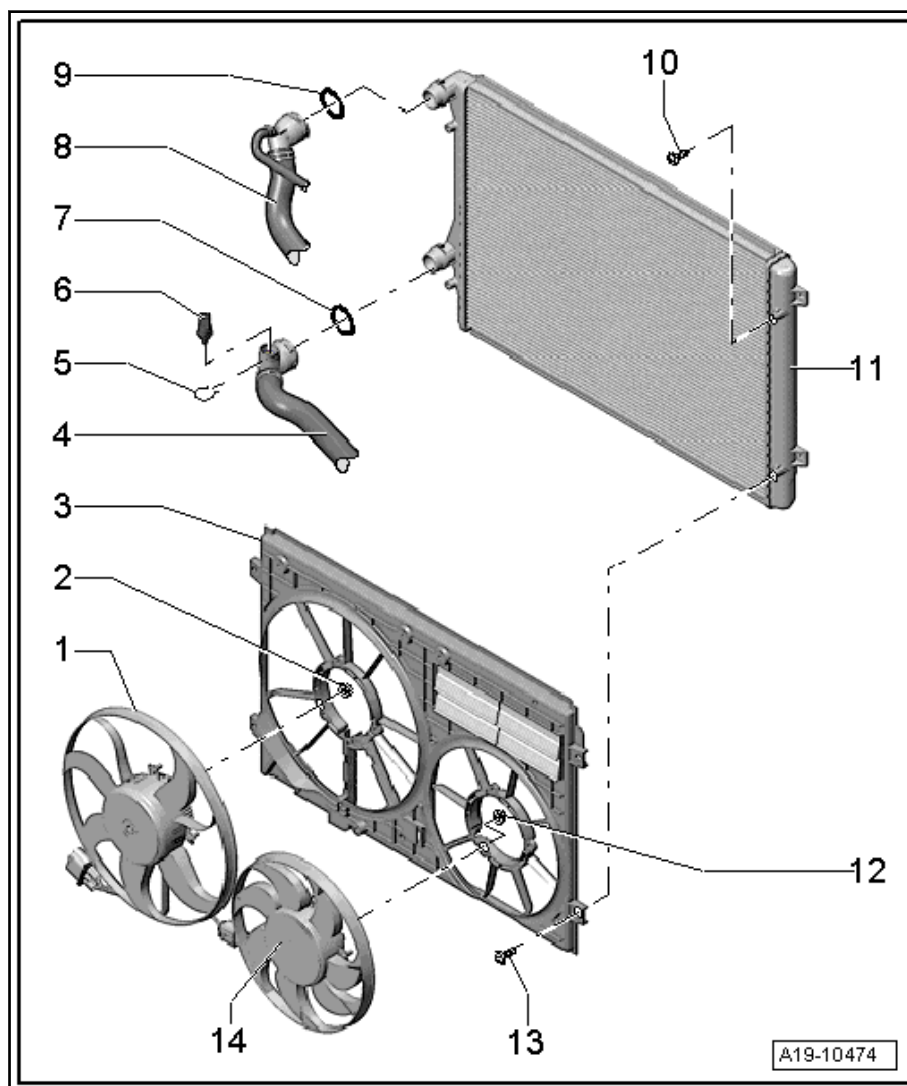
- ☐ 10 Nm

## 13 - Bolt

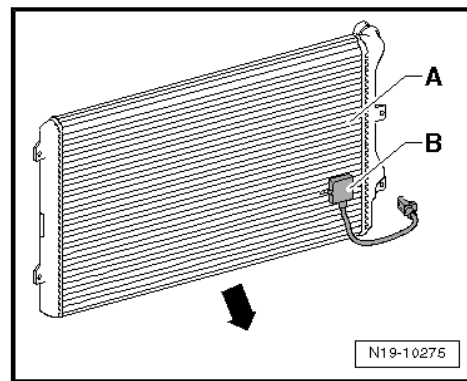
- ☐ 5 Nm
- ☐ On the radiator

## 14 - Radiator Fan 2 -V177-

- ☐ Removing and installing. Refer to ➤ [R4.4 radiator Fan V7 and Radiator Fan 2V177, Removing and Installing](#), page 261 .



## Radiator Identification Sensor -G611- (Engine Code CBFA)



The -arrow- points in the direction of travel.

A - Radiator

B - Radiator Identification Sensor -G611-



#### Note

*The Radiator Identification Sensor -G611- can be replaced only with the radiator.*

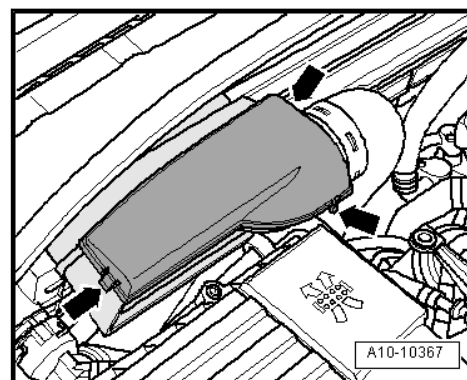
## 4.2 Radiator, Removing and Installing

Special tools and workshop equipment required

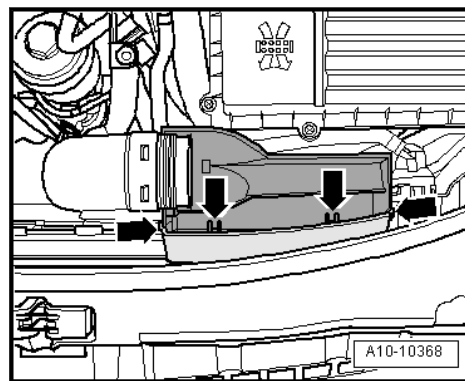
- ◆ Torque Wrench 1783 - 2-10Nm -VAG1783-

### Removing

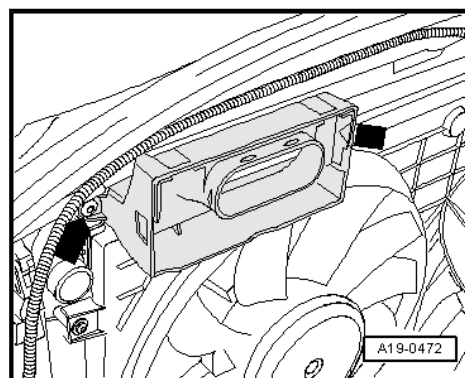
- Drain the coolant. Refer to [⇒ D1.3 draining and Filling](#), page 226 .
- Disengage the side clips -arrows- and remove the cover for the air duct.



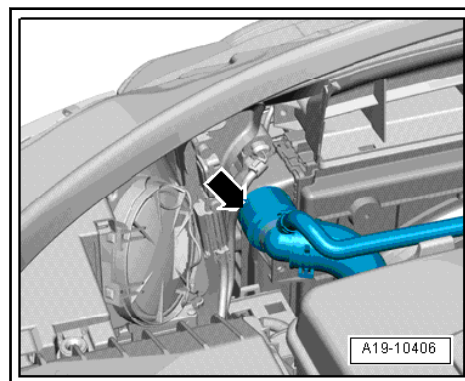
- Disengage the wire retainers -arrows- to unclip the lower air duct.



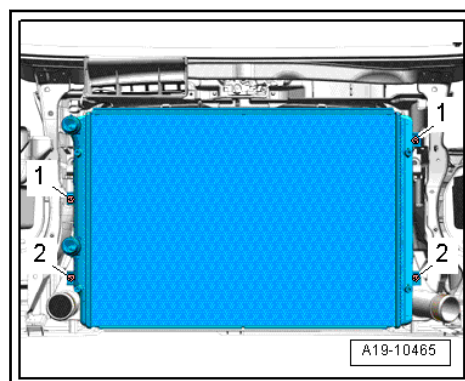
- Remove the air guide from the lock carrier -arrows-.



- Remove the lower air duct with the air duct hose.
- Remove the fan shroud. Refer to [⇒ S4.3 hroud with Radiator Fan, Removing and Installing](#), page 259 .
- Remove the upper coolant hose -arrow- from the radiator.



- Remove the bolts -1 and 2- and remove the radiator.





## Installing

Install in reverse order of removal. Note the following:

- Check the coolant level. Refer to ⇒ [D1.3 raining and Filling](#), page 226 .

## Tightening Specification

- ◆ Refer to ⇒ [-3.1 Air Filter Housing](#), page 310
- ◆ Refer to ⇒ [-2.2 Charge Air System](#), page 283
- ◆ Refer to ⇒ [-4.1 Radiator/Radiator Fan](#), page 255

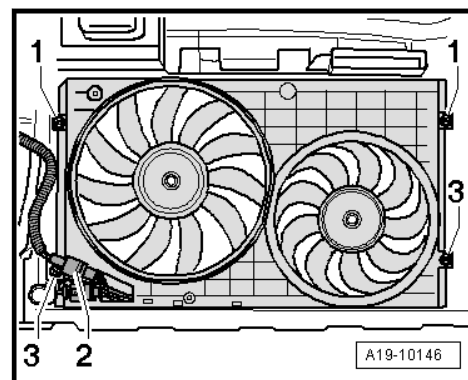
## 4.3 Fan Shroud with Radiator Fan, Removing and Installing

### Special tools and workshop equipment required

- ◆ Torque Wrench 1783 - 2-10Nm -VAG1783-

### Removing

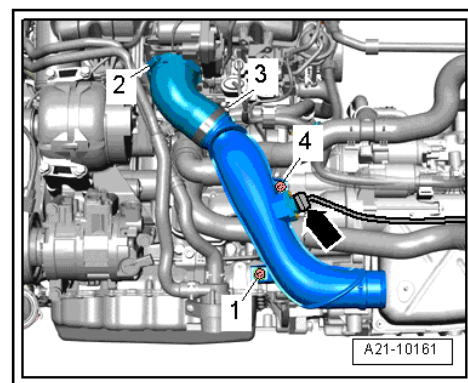
- Remove the bolts -1- from the top.



### Note

*The left bolt is under the coolant connector.*

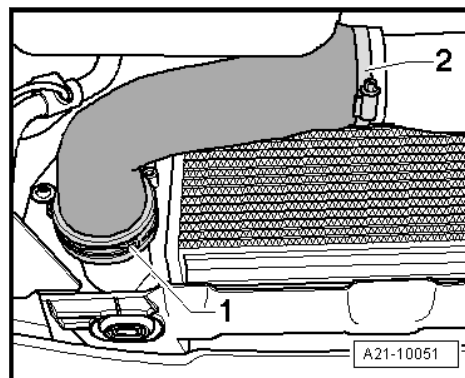
- If equipped, remove the charge air guide to the sound generator.
- Loosen the hose clamp -2-.



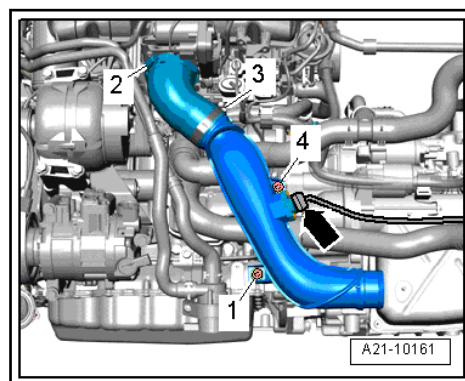
- Remove the bolt -4-.
- Disconnect the connector -arrow- and free up the wire.
- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50; Noise Insulation.



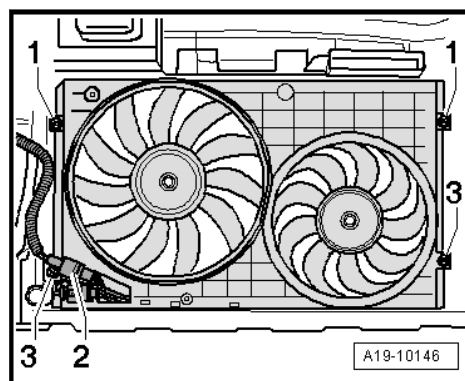
- Disconnect the charge air hose by lifting the clamps -1- and loosening the hose clamp -2-.



- Seal off the connections on the charge air cooler with a clean cloth.
- Remove the bolt -1- and remove the air duct pipe downward.



- Disconnect the connector -2-.
- Remove the bolts -3- and remove the fan shroud downward.



### Installing

Install in reverse order of removal. Note the following:

- Install the air ducts with connector coupling. Refer to [⇒ page 286](#).

### Tightening Specification

- ◆ Refer to [⇒ -2.2 Charge Air System](#), page 283
- ◆ Refer to [⇒ -4.1 Radiator/Radiator Fan](#), page 255



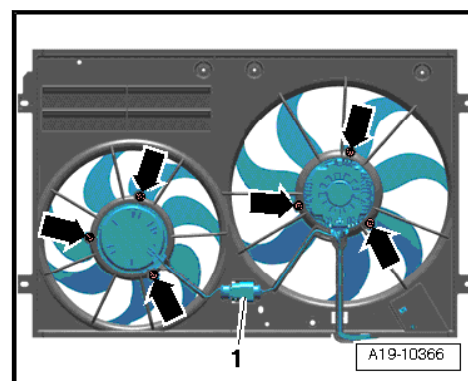
## 4.4 Radiator Fan -V7- and Radiator Fan 2 -V177-, Removing and Installing

Special tools and workshop equipment required

- ◆ Torque Wrench 1783 - 2-10Nm -VAG1783-

### Removing

- Remove the fan shroud. Refer to [⇒ S4.3 hroud with Radiator Fan, Removing and Installing”, page 259](#) .
- Disconnect the connector -1-.
- Free up the wires.
- Remove the bolts -arrows- and remove the Radiator Fan.



### Installing

Install in reverse order of removal.

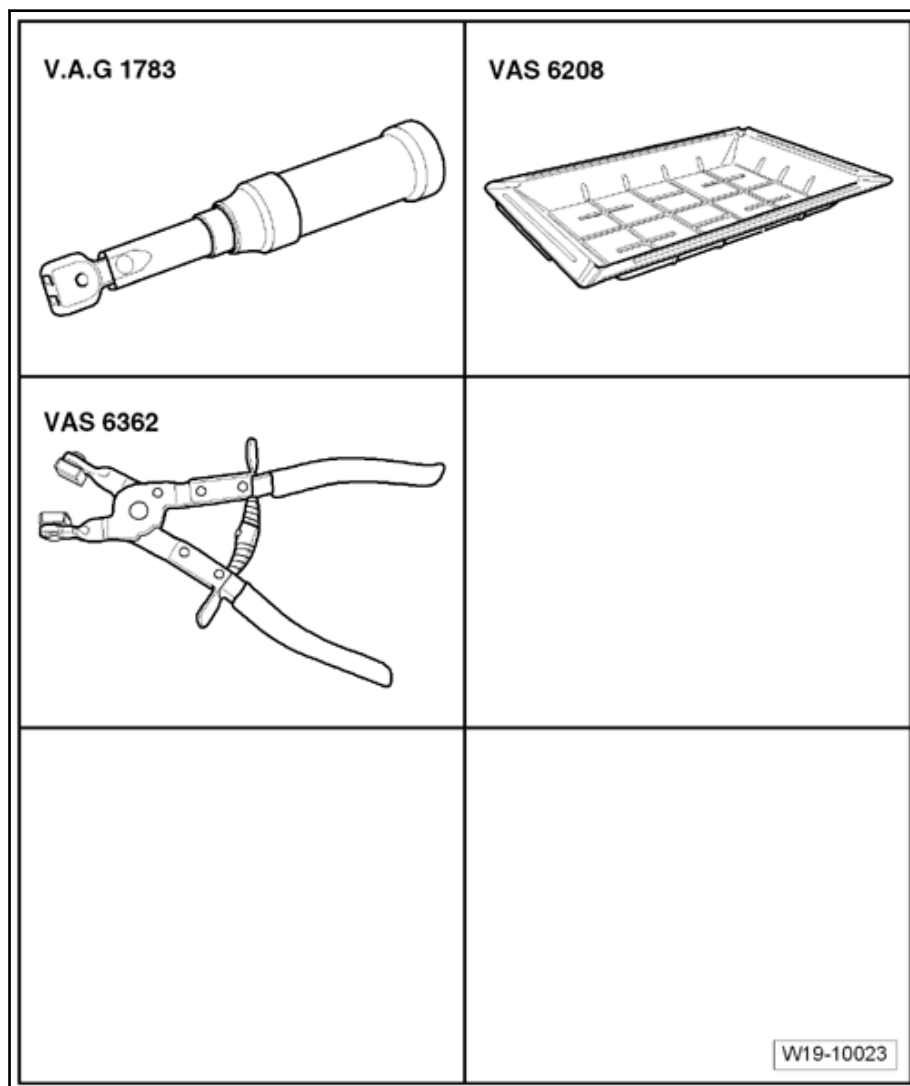
### Tightening Specification

- ◆ Refer to [⇒ -4.1 Radiator/Radiator Fan”, page 255](#)



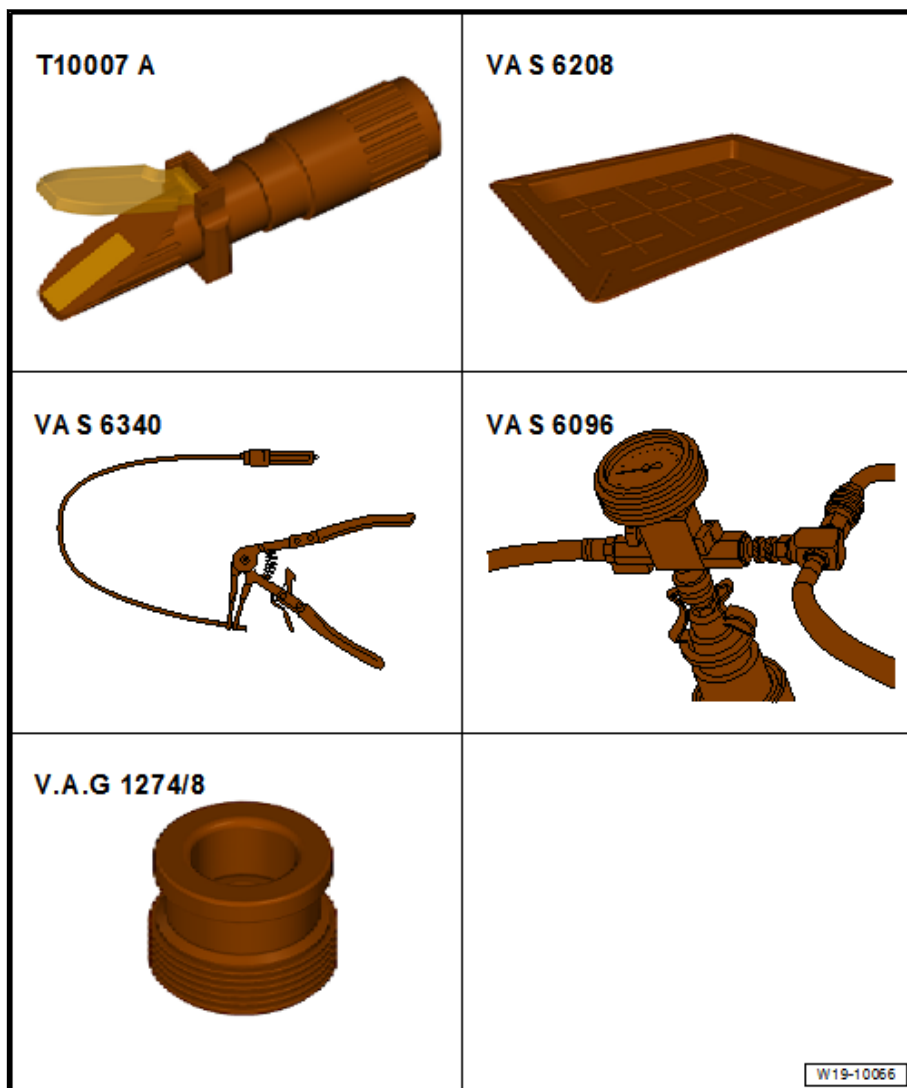
## 5 Special Tools

Special tools and workshop equipment required



- ◆ Torque Wrench 1783 - 2-10Nm -VAG1783-
- ◆ Drip Tray for VAG1202A -VAG1306- or Shop Crane - Drip Tray -VAS6208-
- ◆ Spring Clip Pliers -VAS6362-
- ◆



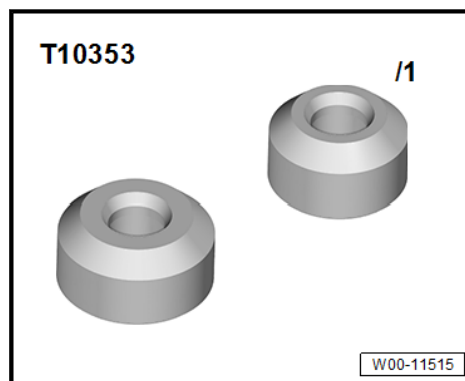


- ◆ Refractometer -T10007A-
- ◆ Drip Tray for VAG1202A -VAG1306- or Shop Crane - Drip Tray -VAS6208-
- ◆ Spring Clip Pliers
- ◆ Cooling System Charge Kit -VAS6096-
- ◆ Cooling System Tester - Adapter -VAG1274/8-
- ◆ Coolant additive -G 12 plus-plus-
- ◆ Hex Ball Socket -T10058-

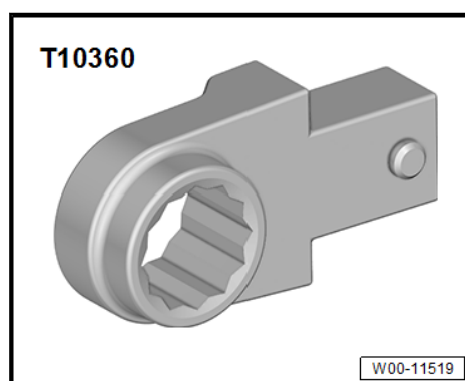




◆ Seal Installer - Intermediate Shaft -T10353-



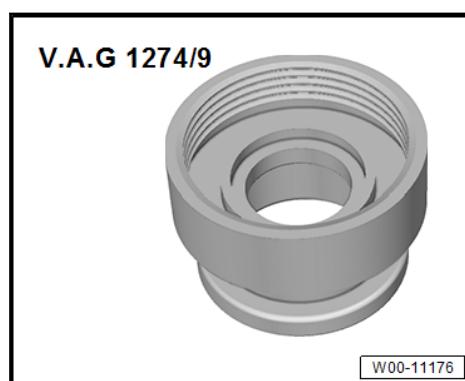
◆ Torque Wrench 1331 Insert - Ring Wrench - 12mm -T10360-



◆ Cooling System Tester -VAG1274B-



◆ Cooling System Tester - Adapter -VAG1274/9-





- ◆ Torque Wrench 1331 5-50Nm -VAG1331-

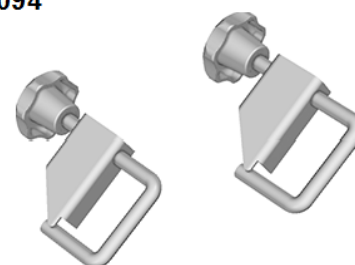
**V.A.G 1331**



W00-11166

- ◆ Hose Clamps - Up To 25mm -3094-

**3094**



W00-11130



## 21 – Turbocharger, Supercharger

### 1 Turbocharger

⇒ [1.1 Turbocharger", page 266](#)

⇒ [R1.2 emoving and Installing", page 272](#)

⇒ [V1.3 acuum Diaphragm, Checking", page 279](#)

⇒ [V1.4 acuum Diaphragm, Replacing", page 280](#)

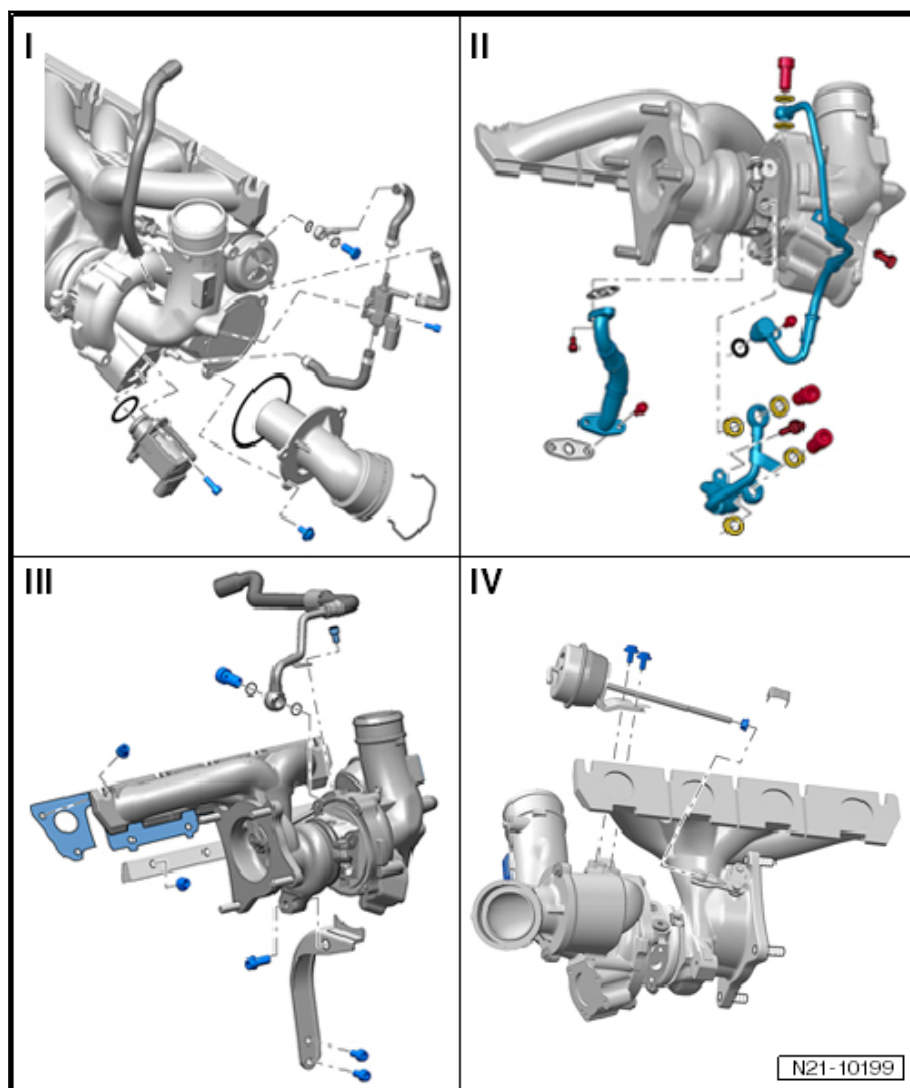
#### 1.1 Overview - Turbocharger

⇒ [11.1.1 ", page 266](#)

⇒ [11.1.2 I", page 268](#)

⇒ [11.1.3 II", page 269](#)

⇒ [11.1.4 V", page 271](#)



#### 1.1.1 Part I



## 1 - Turbocharger

- ☐ Can be replaced only with the exhaust manifold
- ☐ Coat the stud bolts on the exhaust manifold with hot bolt paste; hot bolt paste. Refer to the Parts Catalog.
- ☐ Removing and installing. Refer to [⇒ R1.2 emoving and Installing", page 272](#).

## 2 - Connecting Hose

- ☐ Check for secure fit

## 3 - Charge Air Pressure Regulation Vacuum Diaphragm

- ☐ Checking. Refer to [⇒ V1.3 acuum Diaphragm, Checking", page 279](#).
- ☐ Removing and installing. Refer to [⇒ V1.4 acuum Diaphragm, Replacing", page 280](#).

## 4 - Connecting Hose

- ☐ Check for secure fit

## 5 - Connecting Hose

- ☐ Check for secure fit

## 6 - Bolt

- ☐ 3 Nm

## 7 - Wastegate Bypass Regulator Valve -N75-

## 8 - Connecting Hose

- ☐ Check for secure fit

## 9 - Connection

## 10 - Clip

## 11 - Bolt

- ☐ 9 Nm

## 12 - Seal

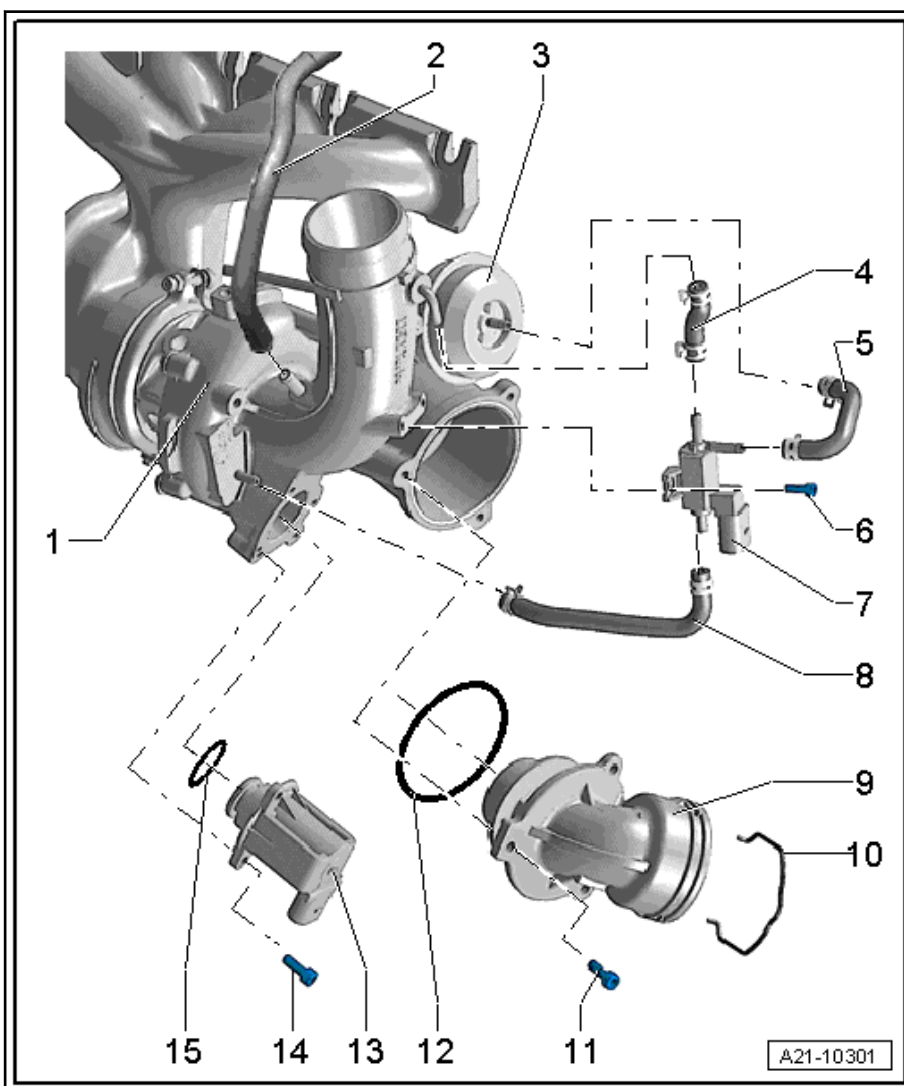
## 13 - Turbocharger Recirculation Valve -N249-

- ☐ Note the installation position. Refer to [⇒ Fig. "" Turbocharger Recirculation Valve -N249- Installation Position""", page 267](#).

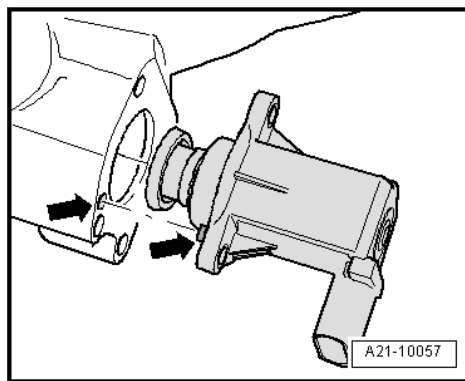
## 14 - Bolt

- ☐ 7 Nm

## 15 - Seal



Turbocharger Recirculation Valve -N249- Installation Position



– Note the installation location -arrows-.

### 1.1.2 Part II

**1 - Seal**

- ☐ Replace after removing

**2 - Banjo Bolt**

- ☐ 33 Nm

**3 - Oil Supply Line****4 - Turbocharger**

- ☐ Can be replaced only with the exhaust manifold
- ☐ Coat the stud bolts on the exhaust manifold with hot bolt paste; hot bolt paste. Refer to the Parts Catalog.
- ☐ Removing and installing. Refer to [R1.2 removing and Installing](#), page 272 .

**5 - Bolt**

- ☐ 9 Nm

**6 - Bolt**

- ☐ 9 Nm

**7 - Seal**

- ☐ Replace after removing

**8 - Banjo Bolt**

- ☐ 38 Nm

**9 - Bolt**

- ☐ 9 Nm

**10 - Banjo Bolt**

- ☐ 38 Nm

**11 - Seal**

- ☐ Replace after removing

**12 - Coolant Supply Line****13 - O-Ring**

- ☐ Replace after removing

**14 - Bolt**

- ☐ 9 Nm

**15 - Seal**

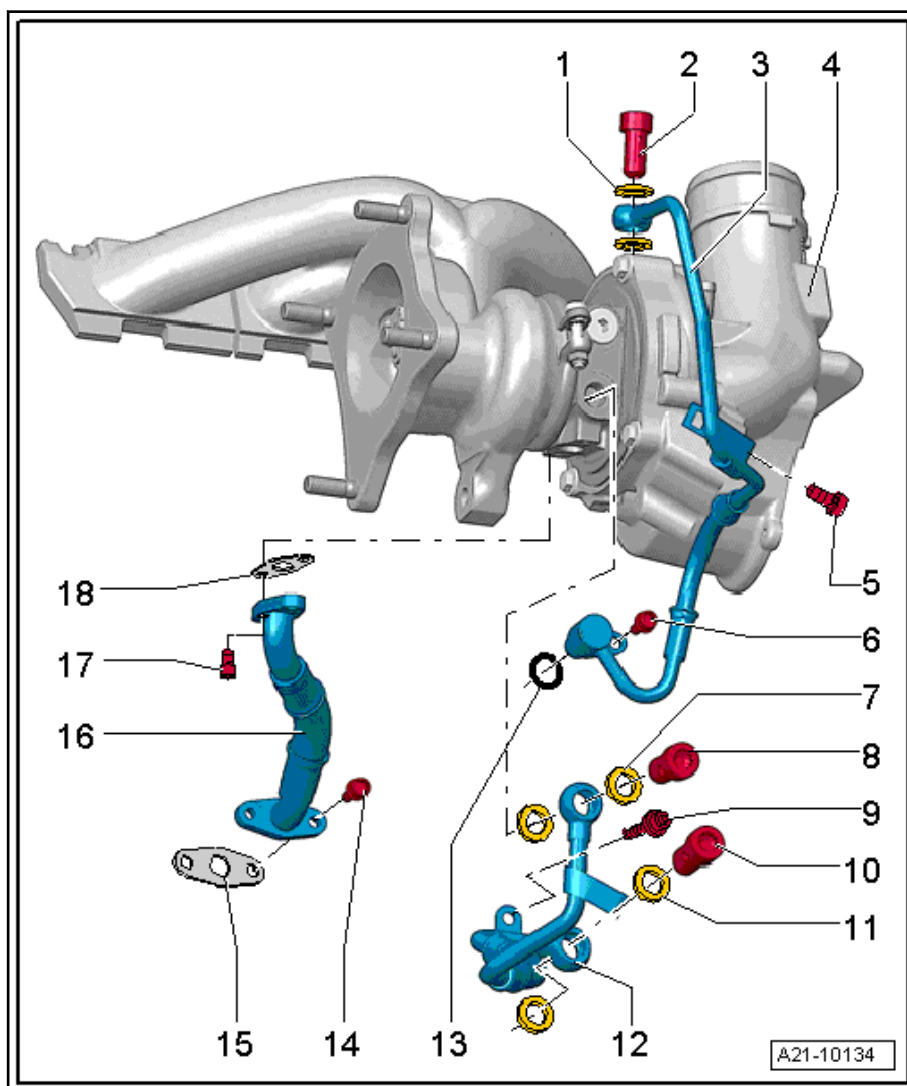
- ☐ Replace after removing

**16 - Oil Return Line****17 - Bolt**

- ☐ 9 Nm

**18 - Seal**

- ☐ Replace after removing

**1.1.3 Part III**



**1 - Seal**

- ☐ Replace after removing

**2 - Nut**

- ☐ Replace after removing
- ☐ Coat the stud bolts on the exhaust manifold with hot bolt paste; hot bolt paste. Refer to the Parts Catalog.
- ☐ Tightening sequence and specification. Refer to ➤ [Fig. "Turbocharger - Tightening Sequence and Specification", page 270](#).

**3 - Banjo Bolt**

- ☐ 38 Nm

**4 - Seal**

- ☐ Replace after removing

**5 - Coolant Return Line**

**6 - Bolt**

- ☐ 9 Nm

**7 - Turbocharger**

- ☐ Can be replaced only with the exhaust manifold
- ☐ Coat the stud bolts on the exhaust manifold with hot bolt paste; hot bolt paste. Refer to the Parts Catalog.
- ☐ Removing and installing. Refer to ➤ [R1.2 removing and Installing", page 272](#).

**8 - Bracket**

**9 - Bolt**

- ☐ 30 Nm
- ☐ Coat bolt with hot bolt paste; hot bolt paste. Refer to the Parts Catalog.

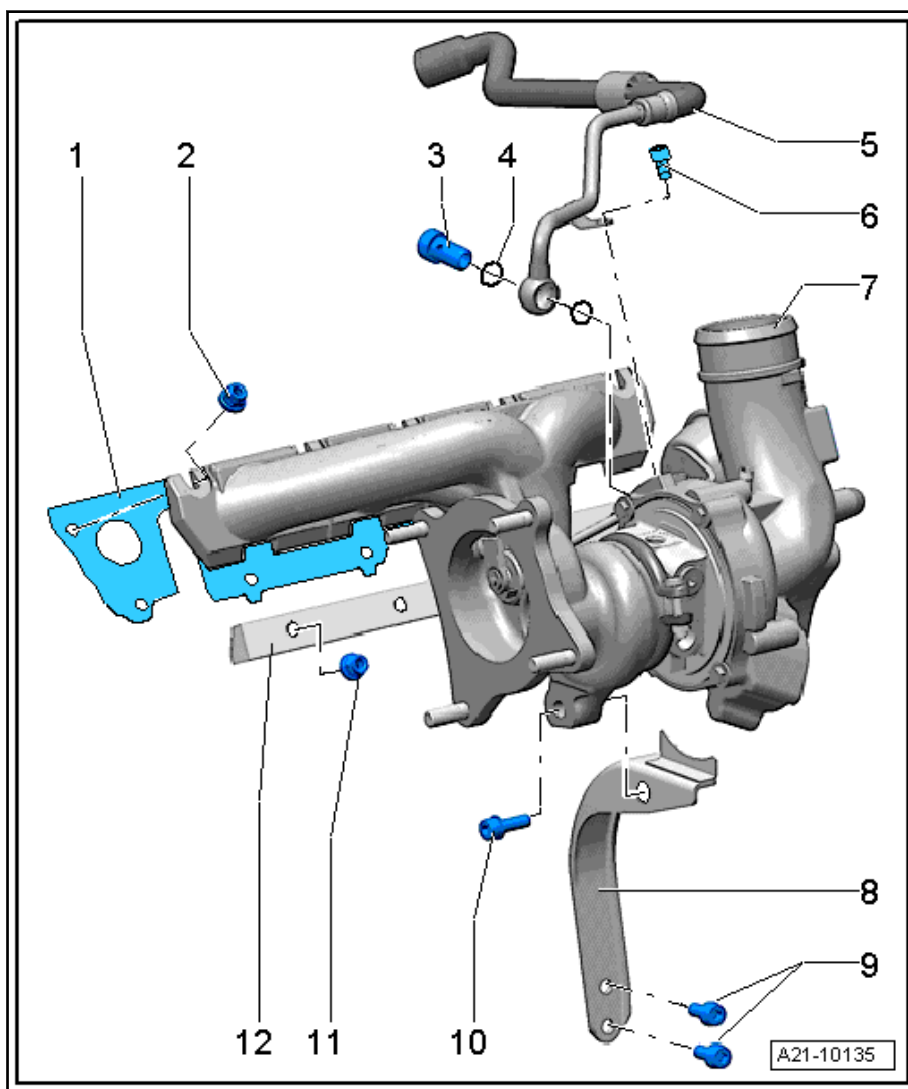
**10 - Bolt**

- ☐ 30 Nm
- ☐ Coat bolt with hot bolt paste; hot bolt paste. Refer to the Parts Catalog.

**11 - Nut**

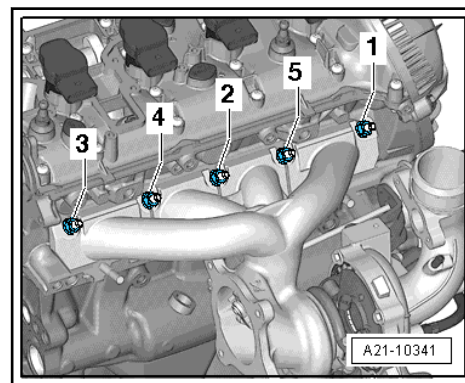
- ☐ 30 Nm
- ☐ Do not loosen to remove turbocharger
- ☐ Replace after removing
- ☐ Coat the stud bolts on the exhaust manifold with hot bolt paste; hot bolt paste Parts Catalog.

**12 - Clamping Strip**



**Turbocharger - Tightening Sequence and Specification**





– Tighten nuts in -1 to 5- sequence as follows:

| Step | Bolts    | Tightening Specification |
|------|----------|--------------------------|
| 1    | -1 to 5- | 5 Nm                     |
| 2    | -1 to 5- | 12 Nm                    |
| 3    | -1 to 5- | 16 Nm                    |
| 4    | -1 to 5- | 25 Nm                    |

### 1.1.4 Part IV

#### 1 - Turbocharger

- ☐ Can be replaced only with the exhaust manifold
- ☐ Coat the stud bolts on the exhaust manifold with hot bolt paste; hot bolt paste. Refer to the Parts Catalog.
- ☐ Removing and installing. Refer to [⇒ R1.2 removing and Installing](#), page 272 .

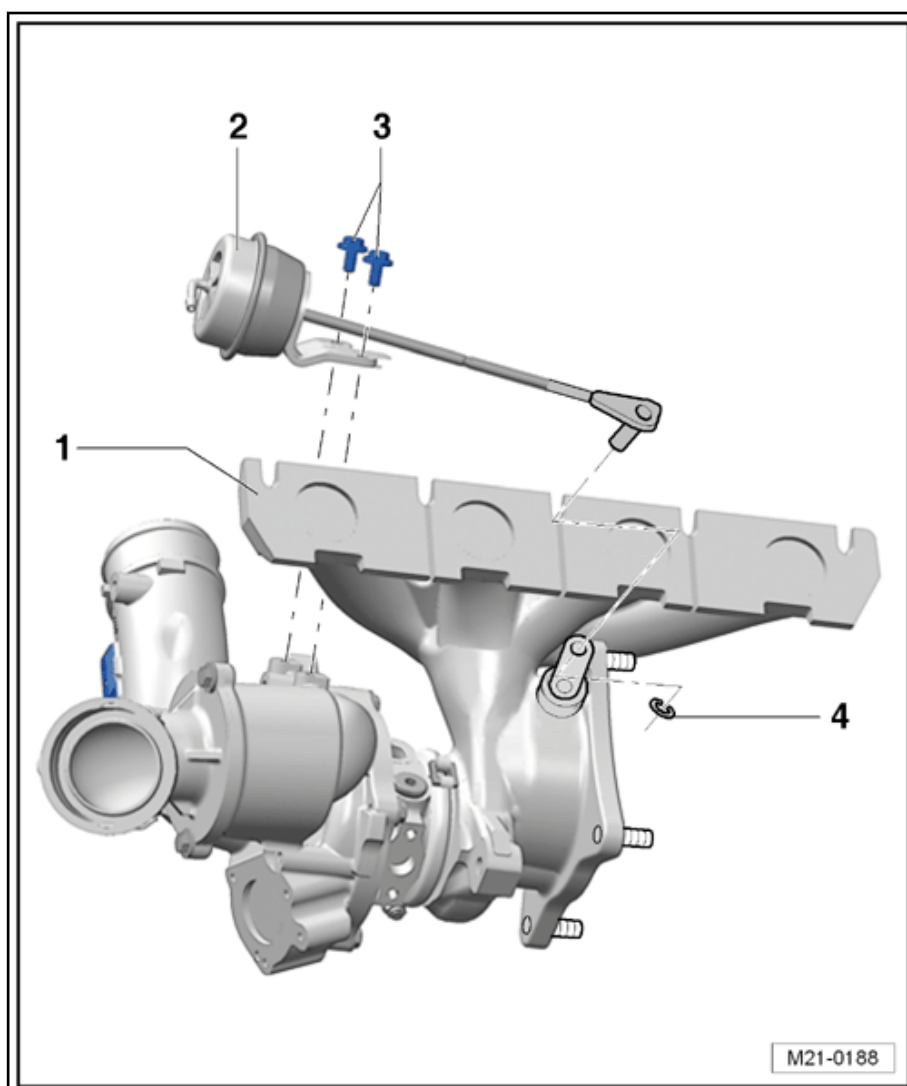
#### 2 - Charge Air Pressure Regulation Vacuum Diaphragm

- ☐ Checking. Refer to [⇒ V1.3 Vacuum Diaphragm, Checking](#), page 279 .
- ☐ Removing and installing. Refer to [⇒ V1.4 Vacuum Diaphragm, Replacing](#), page 280 .

#### 3 - Bolt

- ☐ 10 Nm

#### 4 - Circlip





## 1.2 Turbocharger, Removing and Installing

### Special tools and workshop equipment required

- ◆ Bits for VAG1331/13 -T10099-
- ◆ Socket - Xzn 10 -T10154-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Spring Clip Pliers
- ◆ Engine Bung Set -VAS6122-
- ◆ Hot Bolt Paste. Refer to the Parts Catalog.



### Note

- ◆ *Hose connections and charge air system hoses must be free of oil and grease before installing. Only on connector couplings, the gasket and sealing surfaces must be lightly oiled. Refer to ➔ [page 286](#).*
- ◆ *Install only approved clamps for securing hose connections. Refer to the Parts Catalog.*
- ◆ *The charge air system must be properly sealed.*
- ◆ *Replace the self-locking nuts.*
- ◆ *Use Spring-Type Clip Pliers to installing spring clips.*
- ◆ *Assembly of hose connections with connection couplings. Refer to ➔ [page 286](#).*
- ◆ *Fill the turbocharger with engine oil at the connection for oil supply line.*
- ◆ *After installing the turbocharger, let the engine run at idle for approximately one minute and without increasing the engine speed. This ensures the turbocharger is supplied with oil.*



### Note

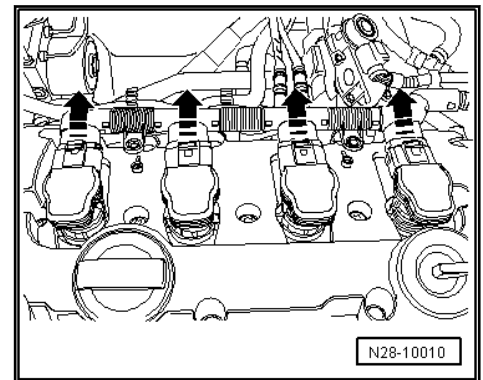
- ◆ *Follow the guidelines for clean working conditions. Refer to ➔ [P1.1 precautions when Working on Fuel Supply System", page 1](#).*
- ◆ *During installation, all heat shields must be reinstalled at the same location.*
- ◆ *If mechanical damage (such as a destroyed compression wheel) is found on the turbocharger, just replacing the turbocharger is not enough. To avoid subsequent damage later, perform the following steps:*
- ◆ *Check the air filter housing, air filter element and air duct hoses for contamination.*
- ◆ *Check the entire charge air circuit and charge air cooler for foreign objects.*
- ◆ *If there are foreign objects in the charge air system, clean the charge air circuit and replace the charge air cooler if necessary.*

### Removing

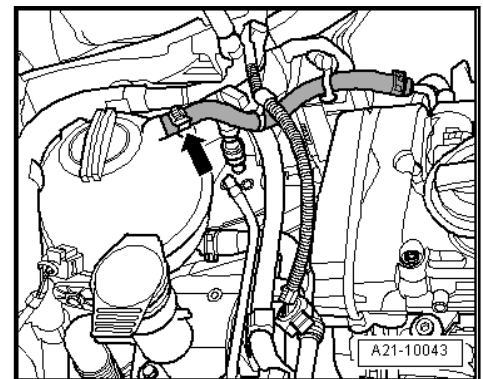
- Remove the engine cover. Refer to ➔ [C3.1 over, Removing and Installing", page 37](#).



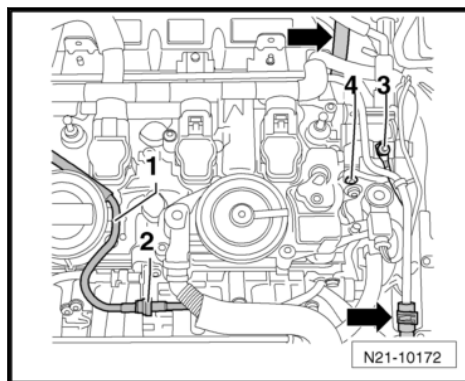
- Remove the air filter. Refer to ⇒ [F3.2 ilter Housing, Removing and Installing](#), page 312 .
- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50; Noise Insulation.
- Remove the right front wheel.
- Remove the right front wheel housing liner. Refer to ⇒ Body Exterior; Rep. Gr. 66; Wheel Housing Liner; Front Wheel Housing Liner, Removing and Installing.
- Drain the coolant. Refer to ⇒ [D1.3 raining and Filling](#), page 226 .
- Disconnect the connectors in direction of -arrows- from the Ignition Coils with Power Output Stages. Set the wiring harness to the side.



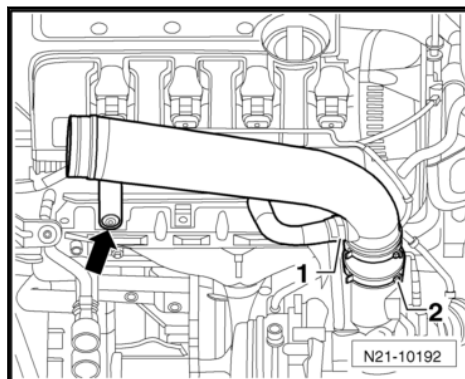
- Disconnect the coolant hose leading to the coolant reservoir -arrow-.



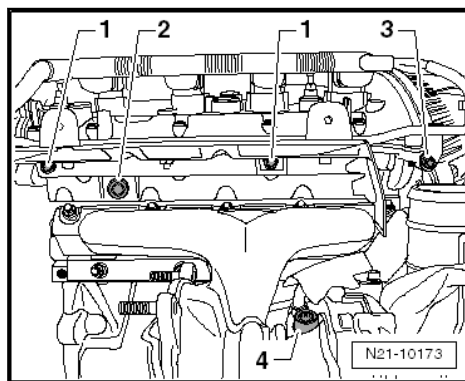
- Disconnect the vacuum line -1- at the separating point -2- and free up the wire.
- Remove the coolant hoses -arrows- from the coolant pipe.
- Disconnect the ground wire -3- and remove the bolt -4-.



- Remove the air duct pipe bolt -arrow-.

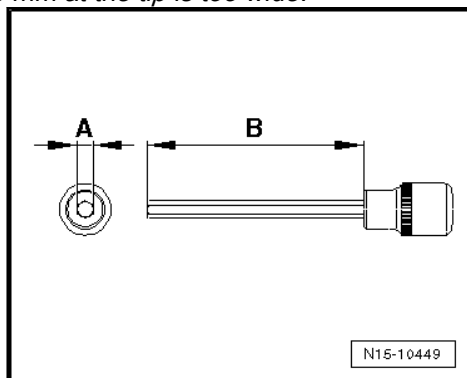


- Loosen the hose clamp -2- and lay the air duct pipe on the cylinder head.
- Seal the turbocharger with the Engine Bung Set -VAS6122-.
- Remove the bolts -1 through 3- and remove the heat shield together with the coolant pipe.

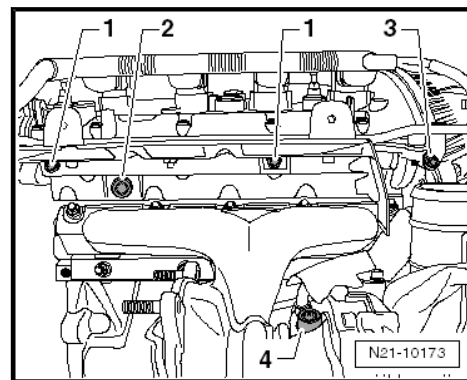


**Note**

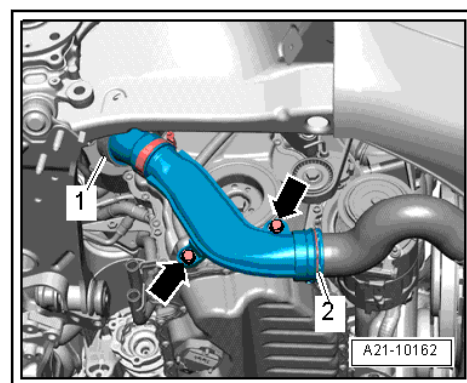
Remove the bolt -2- from the heat shield using a 6 mm hex fitting socket -A-. The hex socket must be at least 5 cm -B- long. A socket that tapers to 6 mm at the tip is too wide.



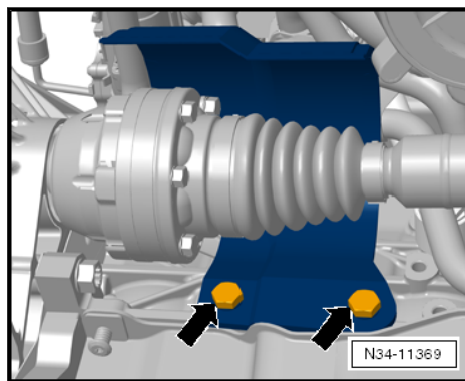
- Disconnect the oil supply line from the turbocharger -4-.



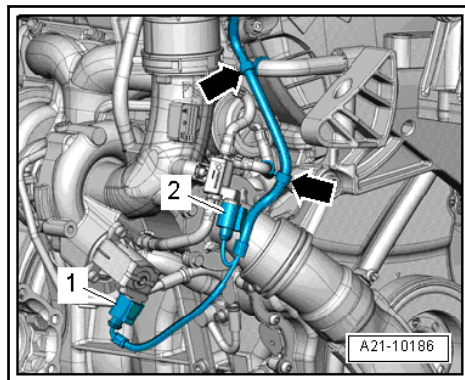
- Remove the bolts -arrows-.



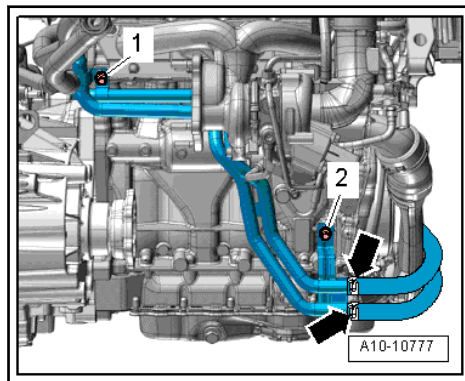
- Open the clamps -1 and 2- and remove the air duct pipe.
- Remove the right drive axle heat shield -arrows-.



- Remove the front exhaust pipe with catalytic converter. Refer to ➤ [E1.2 xhaust Pipe, Removing and Installing](#)”, page [357](#) .
- Disconnect the connectors -1 and 2- and free up the wire -arrows-.



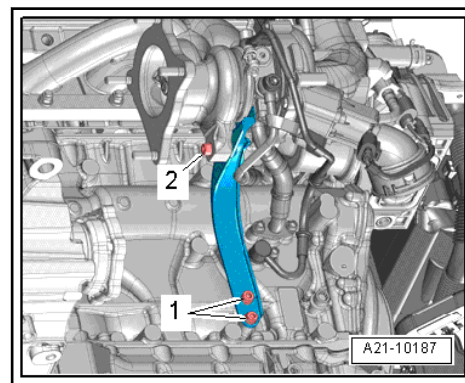
#### Vehicles with Parking Heater:



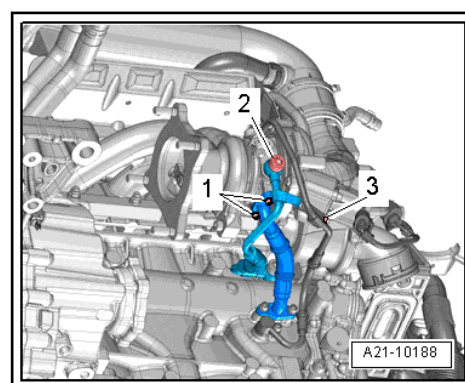
- Remove the bolts -1 and 2- and swivel the coolant tubs to the left.

#### Continuation for All Vehicles

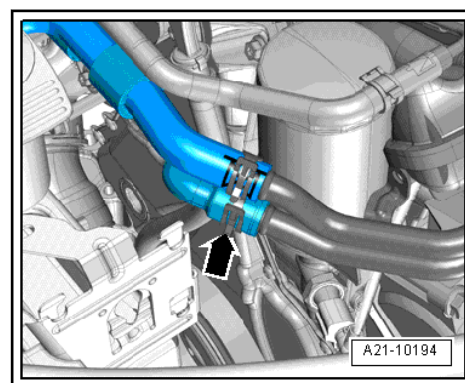
- Remove the bolt -1- using the Socket - Xzn 10 -T10154-.



- Remove the bolt -2-.
- Remove the banjo bolt -2- and move the coolant line to the side.

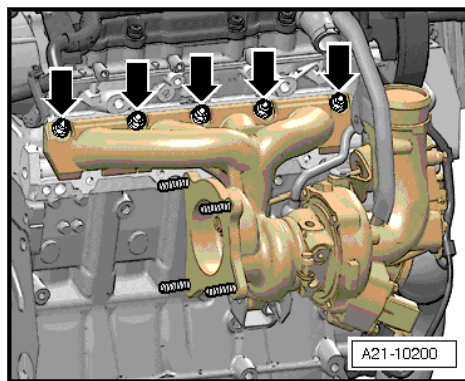


- Remove the bolts -1- on the oil return line.
- Remove the bolt -3- on the oil supply line.
- Disconnect the coolant hose -arrow- and move it to the side.



- Remove the nuts -arrows-.





- Remove the turbocharger/exhaust manifold upward.

### Installing



#### Note

- ♦ Follow the guidelines for clean working conditions. Refer to [⇒ P1.1 recautions when Working on Fuel Supply System, page 1](#).
- ♦ During installation, all heat shields must be reinstalled at the same location.
- ♦ If mechanical damage (such as a destroyed compression wheel) is found on the turbocharger, just replacing the turbocharger is not enough. To avoid subsequent damage later, perform the following steps:
- ♦ Check the air filter housing, air filter element and air duct hoses for contamination.
- ♦ Check the entire charge air circuit and charge air cooler for foreign objects.
- ♦ If there are foreign objects in the charge air system, clean the charge air circuit and replace the charge air cooler if necessary.

Install in reverse order of removal. Note the following:

- ♦ Hose connections and charge air system hoses must be free of oil and grease before installing. Only on connector couplings, the gasket and sealing surfaces must be lightly oiled. Refer to [⇒ page 286](#).
- ♦ Install only approved clamps for securing hose connections. Refer to the Parts Catalog.
- ♦ Replace gaskets, seals and self-locking nuts.
- ♦ Coat the stud bolts on the exhaust manifold with hot bolt paste; hot bolt paste. Refer to the Parts Catalog.
- ♦ Fill the turbocharger with engine oil at the connection for oil supply line.
- ♦ After installing the turbocharger, let the engine run at idle for approximately one minute and without increasing the engine speed. This ensures the turbocharger is supplied with oil.
- ♦ Coolant return line -item 5- [⇒ Item 5 \(page 270\)](#) must be installed together with turbocharger.
- Pay attention to the information after connecting the Battery. Refer to [⇒ Electrical Equipment; Rep. Gr. 27; Battery; Battery, Disconnecting and Connecting.](#)





- Install the air ducts with connector coupling. Refer to [⇒ page 286](#).
- Check the coolant level. Refer to [⇒ D1.3 raining and Filling](#), [page 226](#).

#### Tightening Specification

- ◆ Refer to [⇒ -2.2 Charge Air System](#), [page 283](#)
- ◆ Refer to [⇒ -1.1 Turbocharger](#), [page 266](#)

### 1.3 Turbocharger Vacuum Diaphragm, Checking

#### Special tools and workshop equipment required

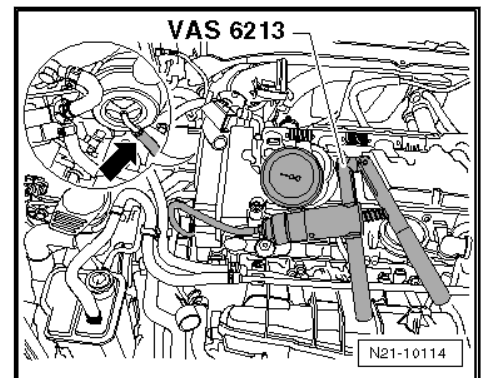
- ◆ Hand Vacuum Pump -VAS6213-

#### Test Conditions

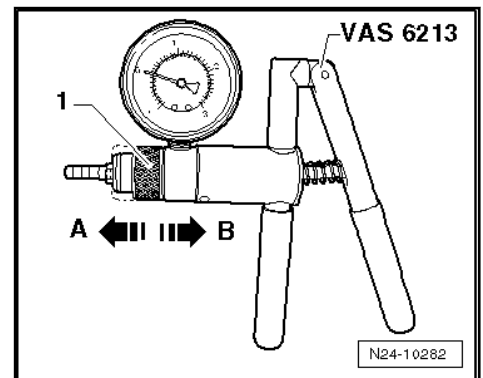
- The hose from the turbocharger over Wastegate Bypass Regulator Valve -N75- must have flow to the vacuum diaphragm.
- Wastegate Bypass Regulator Valve -N75- OK

#### Test Sequence

- Remove the engine cover. Refer to [⇒ C3.1 over, Removing and Installing](#), [page 37](#).
- Connect the Hand Vacuum Pump -VAS6213- to the vacuum diaphragm -arrow-.



- Set the slide ring -1- on the Hand Vacuum Pump -VAS6213- in position -B- for “pressure”.

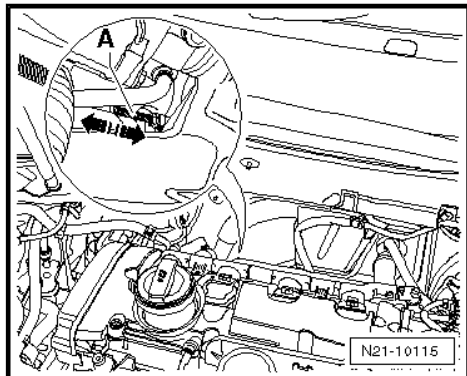




#### Note

*The pressure must not exceed 750 mbar (10.8 psi). If the pressure is exceeded, the vacuum diaphragm can be damaged.*

- Operate the Hand Vacuum Pump -VAS6213- several times and watch the linkage while doing this.
- The linkage -A- must move approximately 300 mbar (4.35 psi) and be at approximately 700 mbar (10.15 psi) at end position.



- The linkage stroke is approximately 10 mm.

If the Hand Vacuum Pump -VAS6213- does not build any pressure or the pressure immediately decreases again:

- Check the Hand Vacuum Pump -VAS6213- and the connecting hoses for leaks.

If no error can be found:

- Replace the vacuum diaphragm. Refer to [⇒ V1.4 vacuum Diaphragm, Replacing](#), page 280 .

## 1.4 Turbocharger Vacuum Diaphragm, Replacing

Special tools and workshop equipment required

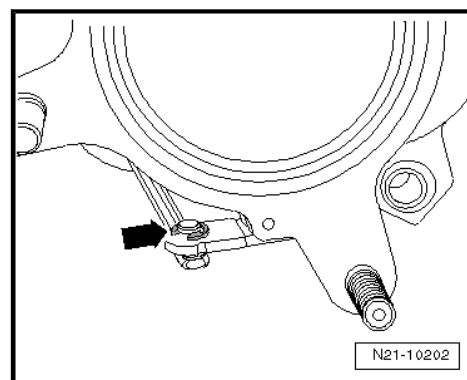
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-

**Note**

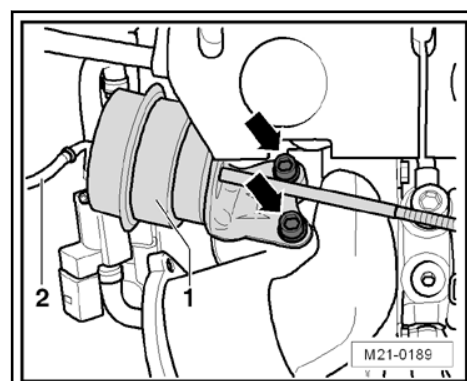
- ◆ *Hose connections and charge air system hoses must be free of oil and grease before installing. Only on connector couplings, the gasket and sealing surfaces must be lightly oiled. Refer to ⇒ [page 286](#).*
- ◆ *Install only approved clamps for securing hose connections. Refer to Parts Catalog.*
- ◆ *The charge air system must be properly sealed.*
- ◆ *Replace the self-locking nuts.*
- ◆ *Use Spring-Type Clip Pliers to installing spring clips.*
- ◆ *Assembly of hose connections with connection couplings. Refer to ⇒ [page 286](#).*
- ◆ *Fill the turbocharger with engine oil at the connection for oil supply line.*
- ◆ *After installing the turbocharger, let the engine run at idle for approximately one minute and without increasing the engine speed. This ensures the turbocharger is supplied with oil.*

**Removing**

- Remove the turbocharger. Refer to ⇒ [R1.2 removing and Installing](#), [page 272](#).
- Remove the circlip -arrow- from the vacuum diaphragm linkage.



- Disconnect the vacuum line -2- on the vacuum diaphragm -1-.
- Remove the vacuum diaphragm -1- from the turbocharger -arrows-.





### Installing

Install in reverse order of removal.

### Tightening Specification

- ◆ Refer to ⇒ [-1.1 Turbocharger](#), page 266



## 2 Charge Air System

⇒ [O2.1 verview - Charge Air System", page 283](#)

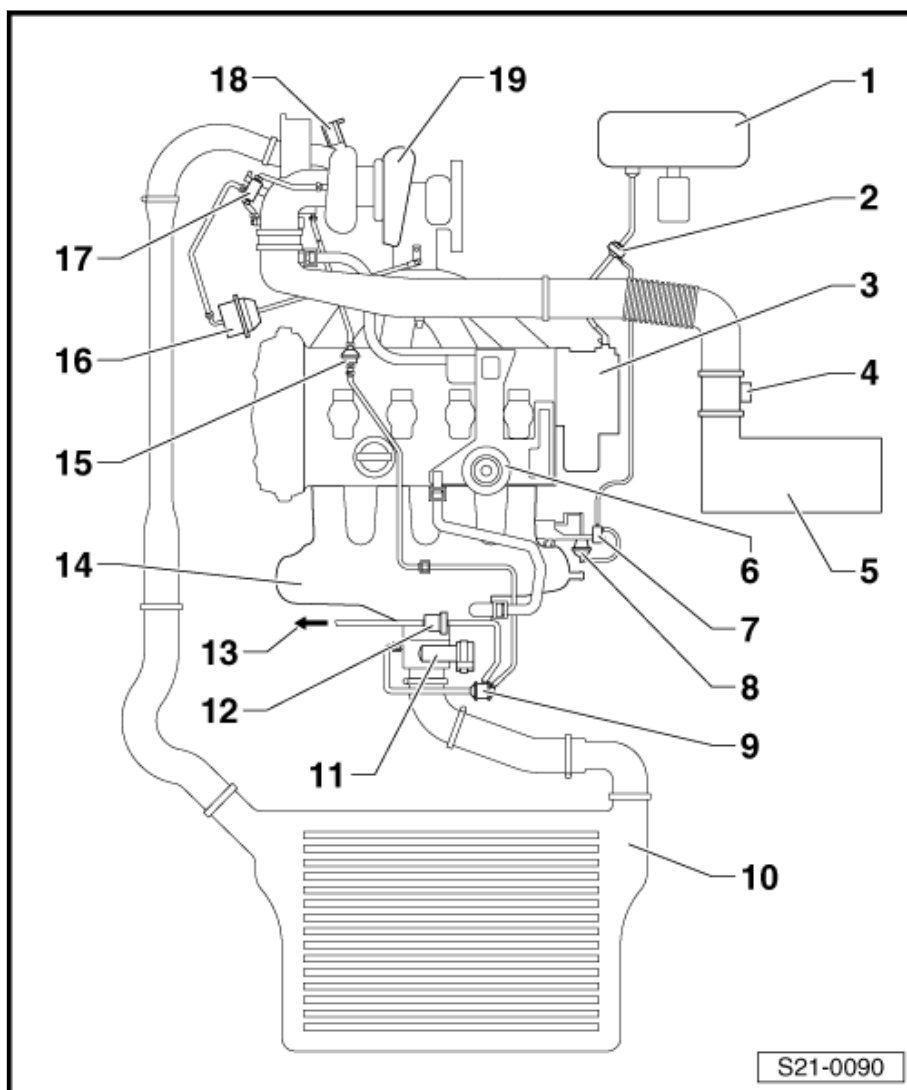
⇒ [-2.2 Charge Air System", page 283](#)

⇒ [A2.3 ir Cooler, Removing and Installing", page 284](#)

⇒ [A2.4 ir System, Checking for Leaks", page 287](#)

### 2.1 Schematic Overview - Charge Air System

- 1 - Brake Booster
- 2 - Check Valve
- 3 - Vacuum Pump
- 4 - Mass Airflow Sensor -G70-
- 5 - Air Filter
- 6 - Pressure Regulating Valve
  - ☐ For the crankcase ventilation
- 7 - Intake Manifold Tuning Valve -N156-
- 8 - Vacuum Diaphragm for the Intake Manifold Change-Over
- 9 - Double Check Valve
  - ☐ Not installed
- 10 - Charge Air Cooler
- 11 - Throttle Valve Control Module -J338-
- 12 - EVAP Canister Purge Regulator Valve 1 -N80-
- 13 - To the EVAP Canister
- 14 - Intake Manifold
- 15 - Check Valve
- 16 - Charge Air Pressure Regulation Vacuum Diaphragm
- 17 - Wastegate Bypass Regulator Valve -N75-
- 18 - Turbocharger Recirculation Valve -N249-
- 19 - Turbocharger



### 2.2 Overview - Charge Air System



**1 - Bolt**

- 5 Nm

**2 - Bearing**

- For the charge air cooler

**3 - Charge Air Cooler**

- Removing and installing. Refer to ➤ [A2.3 in Cooler, Removing and Installing](#), page 284 .

**4 - Charge Air Pipe**

**5 - Bolt**

- 10 Nm

**6 - Charge Air Hose**

- Assembly of hose connections with connection couplings. Refer to ➤ [page 286](#) .

**7 - Charge Air Pipe**

- To the sound generator

**8 - Charge Air Hose**

- Assembly of hose connections with connection couplings. Refer to ➤ [page 286](#) .

**9 - Hose Clamp**

**10 - Charge Air Hose**

- To the Throttle Valve Control Module -J338-

**11 - Charge Air Hose**

**12 - Charge Air Pipe**

**13 - Charge Air Hose**

**14 - Bolt**

- 8 Nm

**15 - Sound Generator**

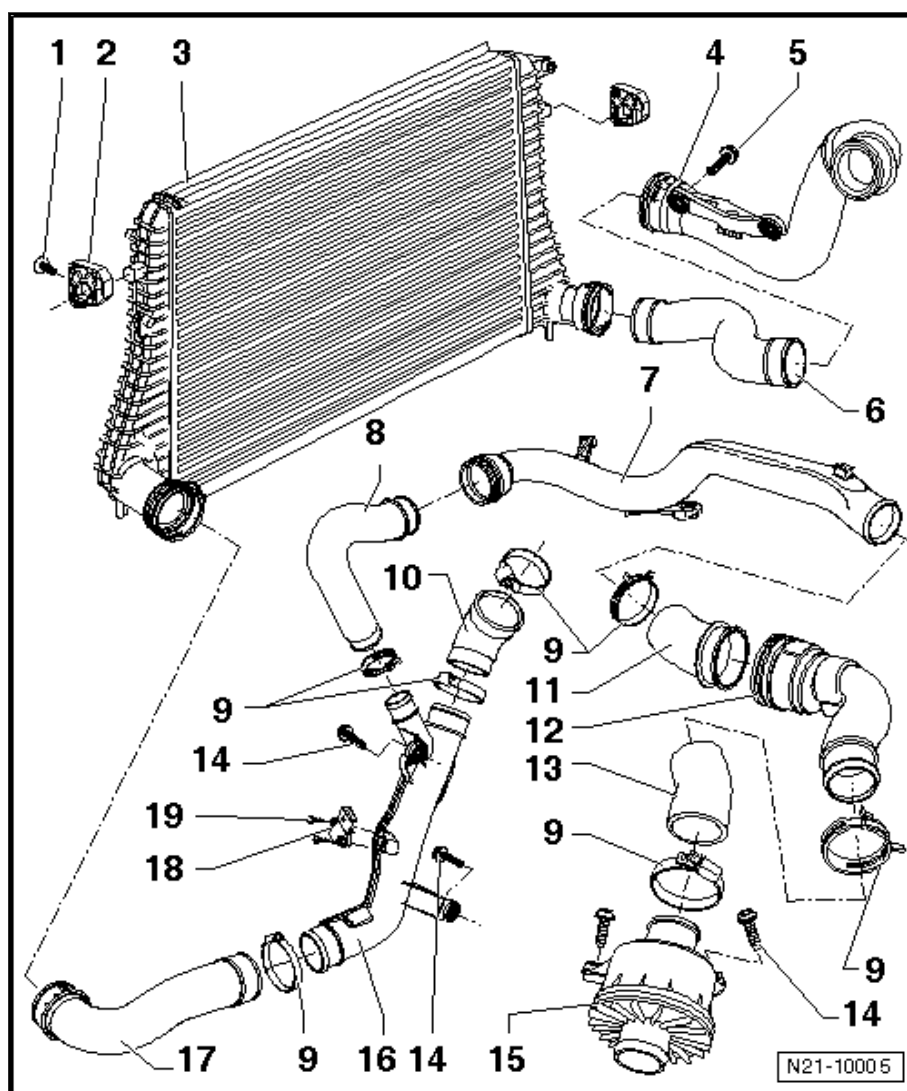
**16 - Charge Air Pipe**

**17 - Charge Air Hose**

**18 - Charge Air Pressure Sensor -G31-**

**19 - Bolt**

- 5 Nm



## 2.3 Charge Air Cooler, Removing and Installing

### Special tools and workshop equipment required

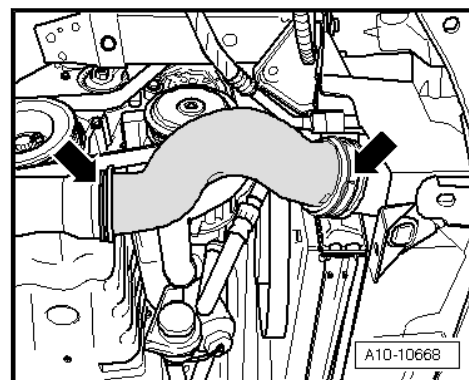
- ◆ Torque Wrench 1783 - 2-10Nm -VAG1783-
- ◆ Cable Tie

**Note**

- ◆ *Hose connections and charge air system hoses must be free of oil and grease before installing. Only on connector couplings, the gasket and sealing surfaces must be lightly oiled. Refer to ⇒ [page 286](#).*
- ◆ *Install only approved clamps for securing hose connections. Refer to Parts Catalog.*
- ◆ *The charge air system must be properly sealed.*
- ◆ *Use Spring-Type Clip Pliers to installing spring clips.*

**Removing**

- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50; Noise Insulation.
- Remove the bumper cover. Refer to ⇒ Body Exterior; Rep. Gr. 63; Front Bumper Cover; Front Bumper Cover, Removing and Installing.
- Drain the coolant. Refer to ⇒ [D1.3 draining and Filling", page 226](#).
- Remove the right charge air hose -arrows-.

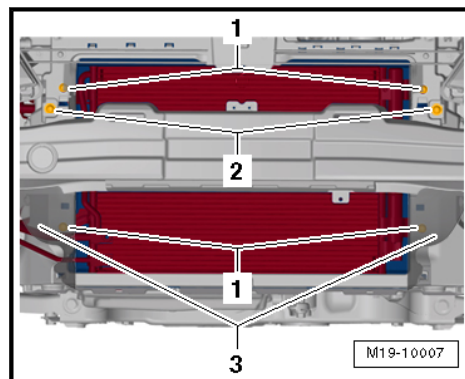


- Remove the fan shroud. Refer to ⇒ [S4.3 hroud with Radiator Fan, Removing and Installing", page 259](#).
- Remove the radiator. Refer to ⇒ [R4.2 emoving and Instal-ling", page 257](#).

**Vehicles with A/C System****Note**

*Do not bend, twist or stretch the refrigerant lines and hoses.*

- Remove the air guides -3- at the bottom.
- Remove the bolts -1- from the condenser.
- Secure the condenser to the lock carrier with cable ties.



### Continuation for All Vehicles

- Remove the bolts -2- from the charge air cooler mounts.
- Push the charge air cooler toward the rear and remove the bearings that are on the side.
- Lift the charge air cooler out of the lower bearing.
- Remove the charge air cooler downward.

### Installing

Install in reverse order of removal. Note the following:

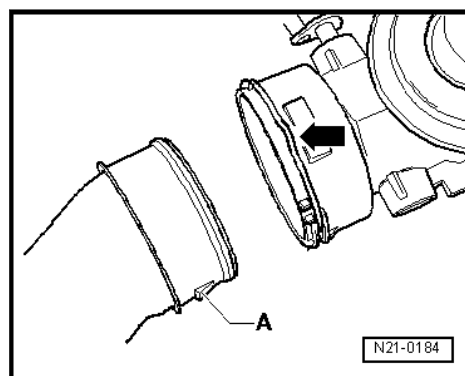
- ◆ Hose connections and charge air system hoses must be free of oil and grease before installing. Only on connector couplings, the gasket and sealing surfaces must be lightly oiled. Refer to ➔ [page 286](#) .
- ◆ Install only approved clamps for securing hose connections. Refer to the Parts Catalog.
- ◆ Assembly of hose connections with connection couplings. Refer to ➔ [page 286](#) .

### Hose Connections with Connector Couplings, Assembling

The connector coupling sealing ring can be damaged if the clamp is in locked position when installing. This would result in a leak. Follow the assembly instructions.

### Removing

- Release the connector coupling by pulling clip -arrow-. Disconnect the hose/tube without assistance from tools.



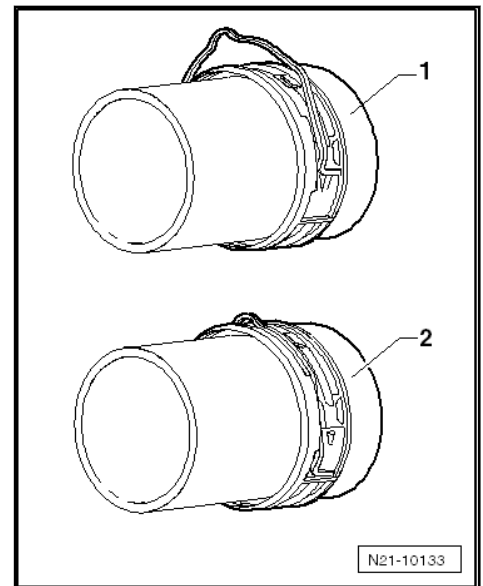
### Installing

- When replacing a gasket, place the gasket in the charge air hose groove. Make sure the gasket is seated in the groove and that it is not twisted.
- Lubricate the sealing surface and the gasket.





- Bring the clip into the release position -1-.



- Slide the charge air hose all the way into the coupling.
- Put the clamp into the locked position -2-. Then press on the charge air hose again.
- Check for correct seating and proper locking of the connector coupling by pulling on hose.

#### Tightening Specification

- ◆ Refer to ⇒ [-4.1 Radiator/Radiator Fan”, page 255](#)
- ◆ Refer to ⇒ [-2.2 Charge Air System”, page 283](#)

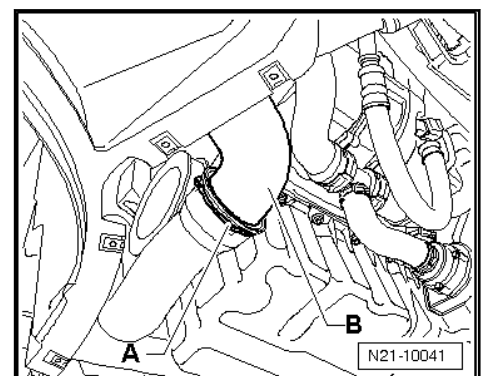
## 2.4 Charge Air System, Checking for Leaks

#### Special tools and workshop equipment required

- ◆ Turbo System Tester Kit -VAG1687- with Turbo System Tester Kit - Adapter 5 -VAG1687/5-
- ◆ Ultrasonic Tester -VAG1842- or commercially available leak detection spray

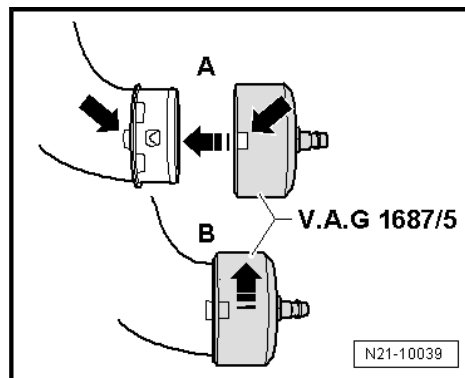
#### Test Sequence

- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50; Noise Insulation.
- Release the clip -A- and remove the hose -B- from the charge air pipe.

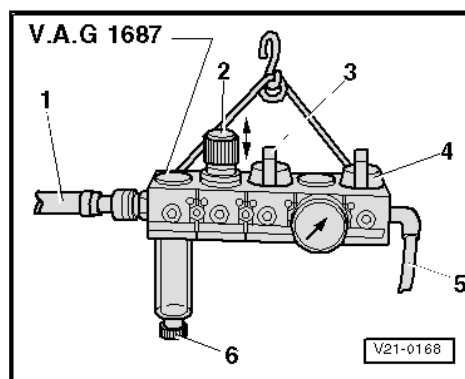




- Mount the Turbo System Tester Kit - Adapter 5 -VAG1687/5- onto the charge air hose -A- and turn it approximately 90° -B-.



Prepare the Turbo System Tester Kit -VAG1687- as follows:



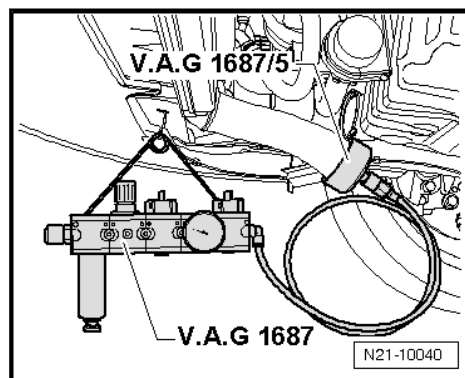
- Turn the pressure regulating valve -2- all the way counter-clockwise.
- Seal valves -3 and 4-.



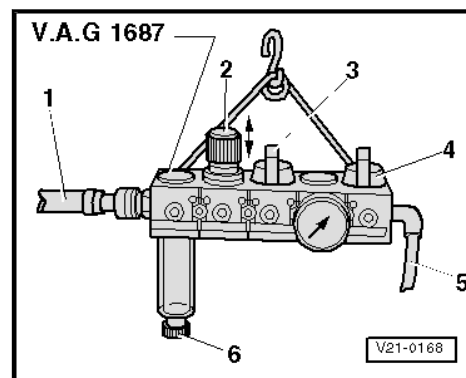
**Note**

*Pull the knob in order to rotate the pressure regulating valve -2-.*

- Connect the Turbo System Tester Kit -VAG1687- as shown.



- Connect the pressurized air hose -1- (pressurized air supply) to the Turbo System Tester Kit -VAG1687-.



### Note

*If there is water in the viewing glass, it must be drained through the drain plug -6-.*

- Open the valve -3-.
- Set the pressure to 0.5 bar (7.2 psi) bar using the pressure control valve -2-.

### Note

*Pressure must not exceed 0.5 bar (7.2 psi)! A pressure set too high may damage the engine.*

- Open the valve -4- and wait until the test circuit is filled. If necessary, regulate the pressure to 0.5 bar (7.2 psi).
- Inspect the charge air system for poorly sealed areas by listening, feeling, using commercially available leak detection spray or by using the Ultrasonic Tester -VAG1842S-.

### Note

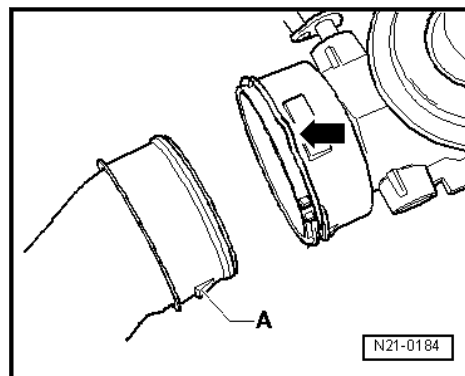
- ◆ *Assembly of hose connections with connection couplings. Refer to [page 286](#).*
- ◆ *A small quantity of air dissipates via the valves in the engine. For this reason a pressure retention test is not possible.*
- ◆ *Information on the Ultrasonic Tester -VAG1842S-. Refer to the Operating Instructions.*
- ◆ *Before removing the adapter, discharge the pressure in test-ing circuit by pulling off the coupling from the Turbo System Tester Kit - Adapter 5 -VAG1687/5-.*
- ◆ *Hose connections and charge air system hoses must be free of oil and grease before installing.*

## Hose Connections with Connector Couplings, Assembling

The connector coupling sealing ring can be damaged if the clamp is in locked position when installing. This would result in a leak. Follow the assembly instructions.

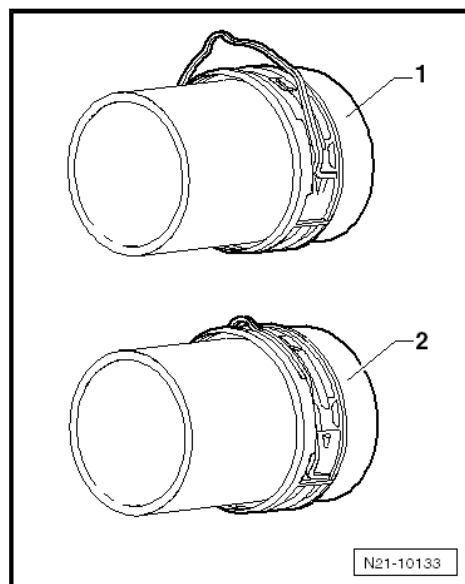
## Removing

- Release the connector coupling by pulling clip -arrow-. Disconnect the hose/tube without assistance from tools.



### Installing

- When replacing a seal, place the seal in the charge air hose groove. Make sure the gasket is seated in the groove and that it is not twisted.
- Lubricate the sealing surface and the seal.
- Bring the clip into the release position -1-.

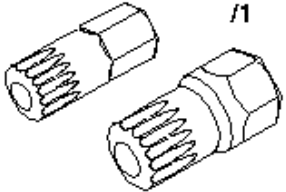
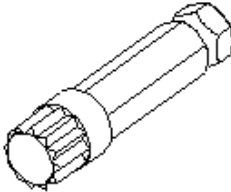

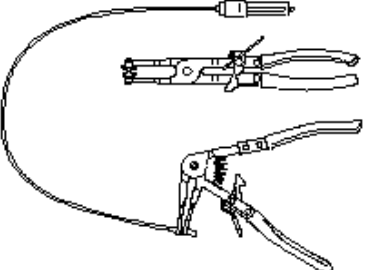



- Slide the charge air hose all the way into the coupling.
- Bring the clip into the locking position -2- and then press on the charge air hose again.
- Check for correct seating and proper locking of the connector coupling by pulling on hose.



### 3 Special Tools

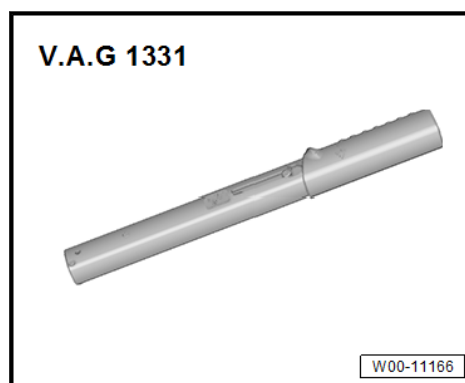
Special tools and workshop equipment required

|   |   |
|---|---|
| <p><b>T10099</b></p>       | <p><b>T10154</b></p>       |
| <p><b>V.A.G 1331</b></p>  | <p><b>VAS 5024 A</b></p>  |
| <p><b>VAS 6122</b></p>   | <p>W21-10003</p>  |

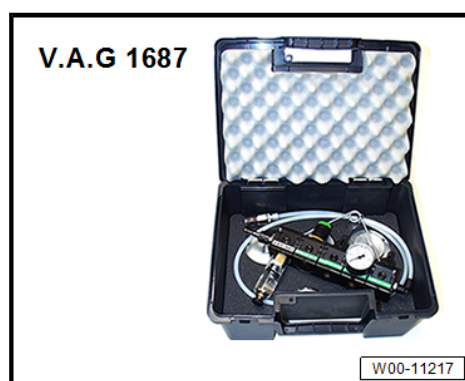
- ◆ Bits for VAG1331/13 -T10099-
- ◆ Socket - Xzn 10 -T10154-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Spring Clip Pliers
- ◆ Engine Bung Set -VAS6122-



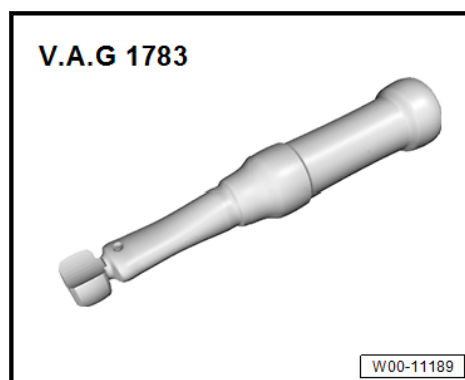
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-



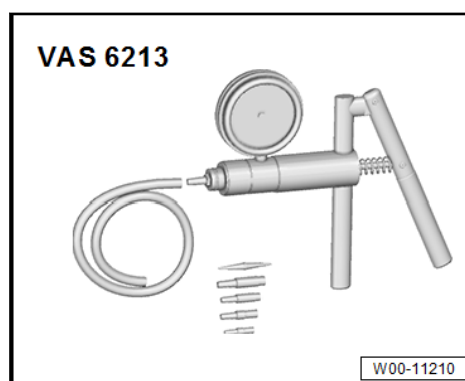
- ◆ Turbo System Tester Kit -VAG1687- with Turbo System Tester Kit - Adapter 5 -VAG1687/5-



- ◆ Torque Wrench 1783 - 2-10Nm -VAG1783-



- ◆ Hand Vacuum Pump -VAS6213-



- ◆ Ultrasonic Tester -VAG1842- or commercially available leak detection spray



## 24 – Multiport Fuel Injection

### 1 Injection System

⇒ [L1.1 Location Overview - Injection System", page 293](#)

⇒ [F1.2 Fuel Pressure, Reducing", page 299](#)

#### 1.1 Component Location Overview - Injection System



##### Note

*Components A through F are not shown in the illustration.*

**A - Data Link Connector**

- ☐ In the driver side footwell

**B - Mass Airflow Sensor - G70-**

- ☐ With Intake Air Temperature Sensor 2 -G299-
- ☐ Component location. Refer to ⇒ [Fig. "Mass Airflow Sensor -G70-1-", page 296](#).
- ☐ Removing and installing. Refer to ⇒ [A5.3 Intake Air Temperature Sensor, Removing and Installing", page 337](#).

**C - Accelerator Pedal Position Sensor -G79- and Accelerator Pedal Position Sensor 2 -G185-**

- ☐ On the accelerator pedal (both sensors are integrated into one housing)

**D - Coolant Fan Control Module -J293-**

- ☐ The Coolant Fan Control Module -J293- is integrated in the Radiator Fan -V7-.

**E - Fuel Injectors**

- ☐ Cylinder 1 Fuel Injector -N30-
- ☐ Cylinder 2 Fuel Injector -N31-
- ☐ Cylinder 3 Fuel Injector -N32-
- ☐ Cylinder 4 Fuel Injector -N33-
- ☐ In the fuel rail. Refer to ⇒ [7.2 Fuel Rail with Fuel Injectors", page 345](#)
- ☐ Removing and installing. Refer to ⇒ [12.1 Injectors, Removing and Installing", page 301](#).
- ☐ Cleaning. Refer to ⇒ [T4.4 Throttle Valve Control Module J338, Cleaning", page 329](#).

**F - EVAP System****1 - Camshaft Adjustment Valve 1 -N205-**

- ☐ Removing and installing. Refer to ⇒ [C4.4 Camshaft Adjustment Valve 1 N205, Removing and Installing", page 169](#).

**2 - Wastegate Bypass Regulator Valve -N75-**

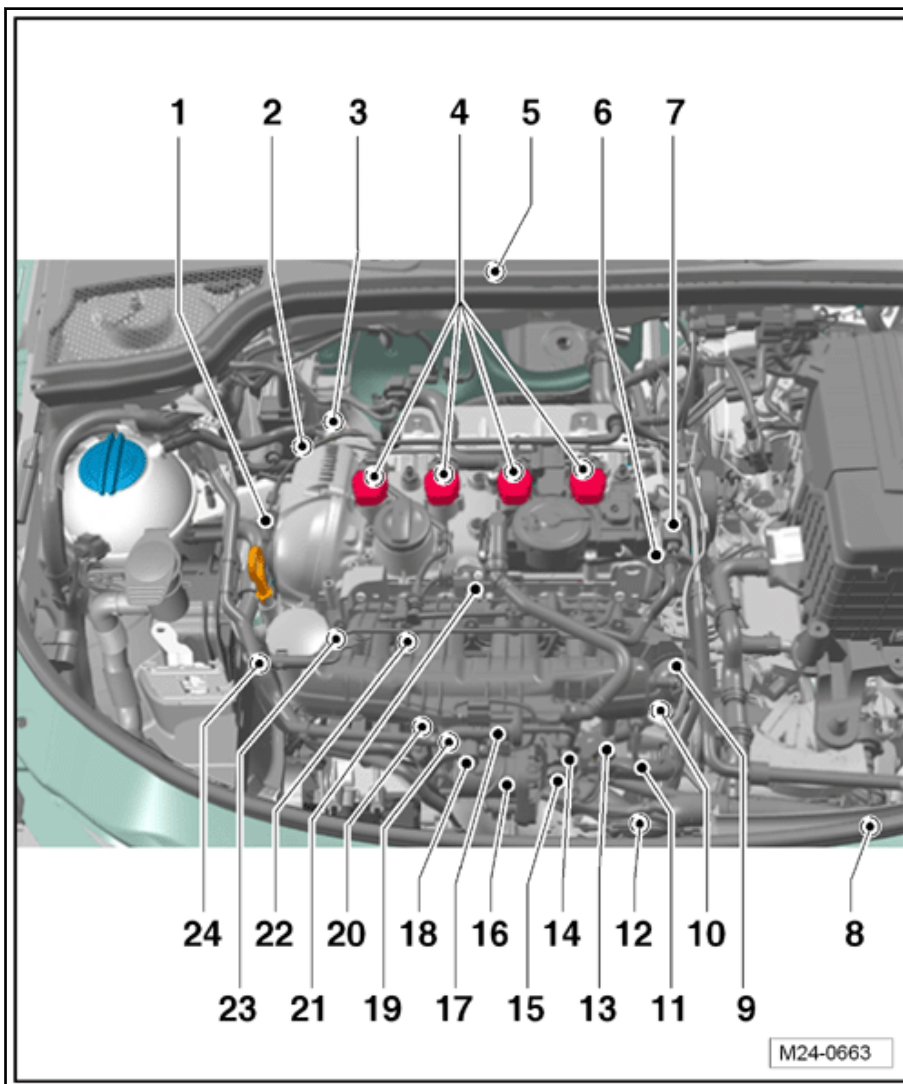
- ☐ Installed directly on turbocharger. Refer to ⇒ [Fig. "Turbocharger Components", page 298](#)

**3 - Turbocharger Recirculation Valve -N249-**

- ☐ Installed directly on turbocharger. Refer to ⇒ [Fig. "Turbocharger Components", page 298](#)

**4 - Ignition Coils with Power Output Stages**

- ☐ Ignition Coil 1 with Power Output Stage -N70-
- ☐ Ignition Coil 2 with Power Output Stage -N127-
- ☐ Ignition Coil 3 with Power Output Stage -N291-
- ☐ Ignition Coil 4 with Power Output Stage -N292-
- ☐ Removing and installing. Refer to ⇒ [C1.3 Ignition Coils with Power Output Stages, Removing and Installing", page 371](#).





**5 - Engine Control Module -J623-**

- ❑ Removing and installing. Refer to ⇒ [E6.1 Engine Control Module J623, Removing and Installing](#), page 340 .

**6 - High Pressure Pump**

- ❑ With Fuel Pressure Regulator Valve -N276-
- ❑ Component location. Refer to ⇒ [Fig. "High Pressure Pump"](#), page 296
- ❑ Removing and installing. Refer to ⇒ [P7.3 Pressure Pump, Removing and Installing](#), page 347 .

**7 - Fuel Pressure Regulator Valve -N276-**

- ❑ Component location. Refer to ⇒ [Fig. "High Pressure Pump"](#), page 296 .

**8 - Engine Coolant Temperature Sensor on Radiator Outlet -G83-**

- ❑ In the lower radiator connection. Refer to ⇒ [-4.1 Radiator/Radiator Fan](#), page 255

**9 - Vacuum Actuator**

- ❑ For variable intake manifold
- ❑ Component location. Refer to ⇒ [Fig. "Intake Manifold Runner Control Valve -N316- -2- "](#), page 296 .

**10 - Intake Manifold Runner Control Valve -N316-**

- ❑ Component location. Refer to ⇒ [Fig. "Intake Manifold Runner Control Valve -N316- -2- "](#), page 296 .

**11 - Engine Speed Sensor -G28-**

- ❑ On the front lower left side of the cylinder block, next to the oil separator. Refer to ⇒ [Fig. "Engine Speed Sensor -G28- -1- "](#), page 297
- ❑ Removing and installing. Refer to ⇒ [E1.5 Engine Speed Sensor G28, Removing and Installing](#), page 374 .

**12 - Charge Air Pressure Sensor -G31-**

- ❑ Component location. Refer to ⇒ [Fig. "Charge Air Pressure Sensor -G31- -1- "](#), page 298 .

**13 - Knock Sensor 1 -G61- Connector**

- ❑ Installed location beneath intake manifold. Refer to ⇒ [Fig. "Connectors"](#), page 297

**14 - Camshaft Position Sensor -G40- Connector**

- ❑ Installed location beneath intake manifold. Refer to ⇒ [Fig. "Connectors"](#), page 297

**15 - 8-Pin Connector for Fuel Injectors**

- ❑ Installed location beneath intake manifold. Refer to ⇒ [Fig. "Connectors"](#), page 297

**16 - Throttle Valve Control Module -J338-**

- ❑ Contains:
  - ◆ EPC Throttle Drive -G186-
  - ◆ EPC Throttle Drive Angle Sensor 1 -G187-
  - ◆ EPC Throttle Drive Angle Sensor 2 -G188-
    - ❑ Removing and installing. Refer to ⇒ [T4.3 Throttle Valve Control Module J338, Removing and Installing](#), page 327 .
    - ❑ Cleaning. Refer to ⇒ [T4.4 Throttle Valve Control Module J338, Cleaning](#), page 329 .

**17 - EVAP Canister Purge Regulator Valve 1 -N80-**

- ❑ Overview - Installed location. Refer to ⇒ [-4.1 Intake Manifold](#), page 316 , Intake Manifold

**18 - Intake Air Temperature Sensor -G42-**

- ❑ Overview - installed location. Refer to ⇒ [-4.1 Intake Manifold](#), page 316 , Intake Manifold

**19 - Knock Sensor 1 -G61-**

- ❑ On the front cylinder head under the intake manifold. Refer to ⇒ [-1.1 Ignition System](#), page 368
- ❑ Removing and installing. Refer to ⇒ [K1.4 Knock Sensor 1 G61, Removing and Installing](#), page 373 .

**20 - Engine Coolant Temperature Sensor -G62-**

- ❑ Inside the coolant pump housing ⇒ [Fig. "Engine Coolant Temperature Sensor -G62- -1- "](#), page 298

**21 - Camshaft Position Sensor -G40-**



- ❑ Bolted on the front cylinder head cover. Refer to ⇒ [Fig. ““ Camshaft Position Sensor -G40- -1- ””, page 297](#)

## 22 - Fuel Pressure Sensor -G247-

- ❑ On the fuel rail. Refer to ⇒ [-7.2 Fuel Rail with Fuel Injectors”, page 345](#) , Overview - Fuel Rail

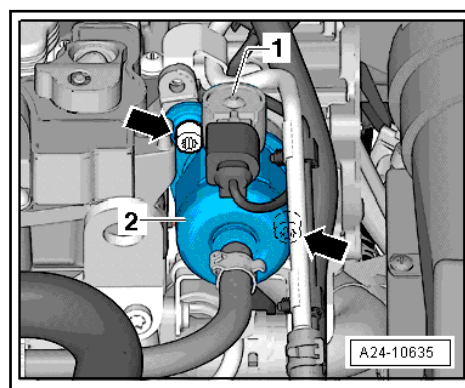
## 23 - Intake Manifold Runner Position Sensor -G336-

- ❑ In the right intake manifold; (refer to ⇒ [-7.2 Fuel Rail with Fuel Injectors”, page 345](#) , fuel rail - Overview
- ❑ To remove and install, remove intake manifold. Refer to ⇒ [M4.2 anifold with Fuel Rail, Removing and Installing”, page 319](#) .

## 24 - Oil Pressure Switch -F1-

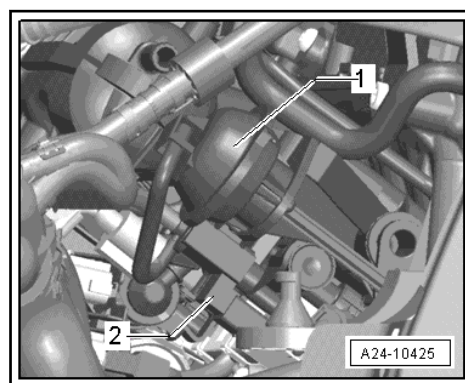
- ❑ Inside the sub-assembly bracket. Refer to ⇒ [-3.1 Oil Filter Housing / Oil Pressure Switch F1 ”, page 206](#)

## High Pressure Pump



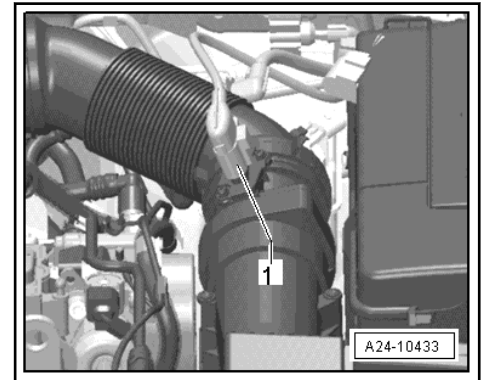
- 1 - Fuel Pressure Regulator Valve -N276-
- 2 - High Pressure Fuel Pump

## Intake Manifold Runner Control Valve -N316- -2-



- 1 - Vacuum actuator for variable intake manifold

## Mass Airflow Sensor -G70- -1-



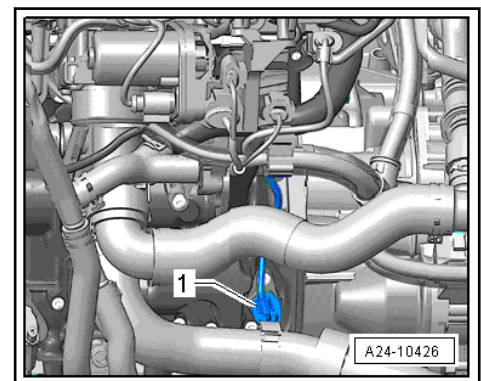
◆ With Intake Air Temperature Sensor 2 -G299-



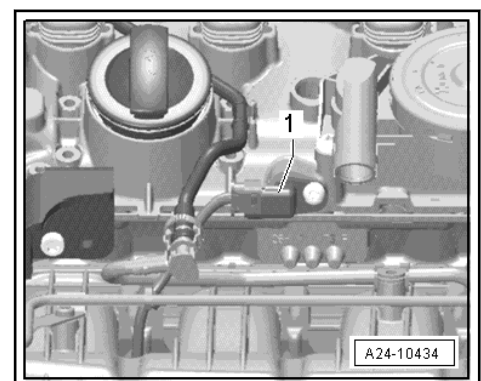
Note

*The Intake Air Temperature Sensor 2 -G299- and the Mass Airflow Sensor -G70- are integrated in one housing.*

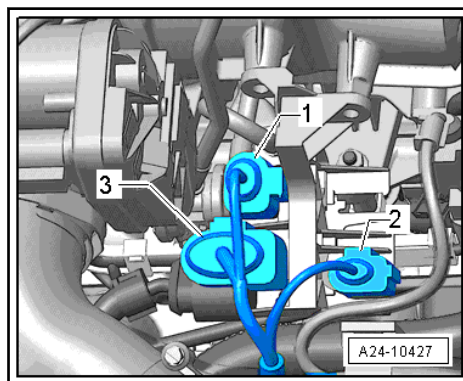
Engine Speed Sensor -G28- -1-



Camshaft Position Sensor -G40- -1-



Connectors

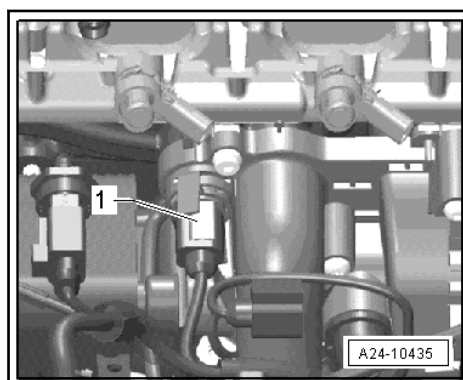


1 - From Camshaft Position Sensor -G40-

2 - From Knock Sensor 1 -G61-

3 - 8-Pin Connector for Fuel Injectors

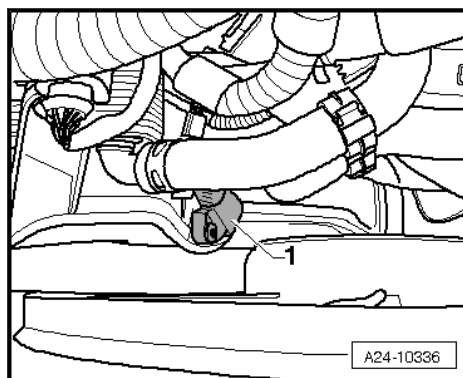
**Engine Coolant Temperature Sensor -G62- -1-**



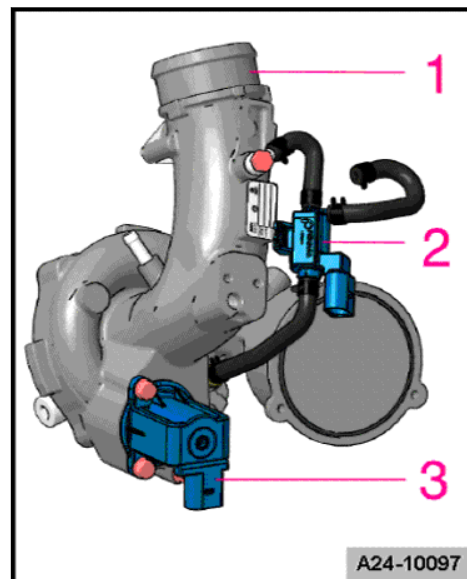
**Note**

*Under the intake manifold (the intake manifold is not shown in the illustration).*

**Charge Air Pressure Sensor -G31- -1-**



**Turbocharger Components**



- 1 - Turbocharger
- 2 - Wastegate Bypass Regulator Valve -N75-
- 3 - Turbocharger Recirculation Valve -N249-

**Note**

Overview - Turbocharger, Part I. Refer to [⇒ 11.1.1](#), page 266.

## 1.2 High Fuel Pressure, Reducing

Special tools and workshop equipment required

- ◆ Vehicle Diagnostic Tester

**WARNING**

The fuel system is under high pressure.

Risk of injury from fuel spraying out.

- Reducing the high fuel pressure.

### Fuel High Pressure, Reducing

- Connect the Vehicle Diagnostic Tester and perform “reduce high fuel pressure” in “Guided Functions”.
- The fuel pressure reduces to a specified value.
- Switch off the ignition.

The fuel rail will continue to be filled with fuel, but it will no longer be under high pressure.

- After reducing fuel high pressure, place a clean cloth around the connection and open the high pressure system »immediately«. Absorb the discharged fuel.



#### Note

- ◆ *If the high pressure system is not opened immediately, the pressure will increase because of post-heating.*
- ◆ *The ignition can no longer be switched on, otherwise the pressure will increase again.*

#### Final Procedures

- Erase the DTC memory and generate the readiness code in the engine control module using “Guided Functions”.



## 2 Fuel Injectors

⇒ [I2.1 injectors, Removing and Installing](#), page 301

⇒ [I2.2 injector Seals, Replacing](#), page 305

⇒ [I2.3 injectors, Cleaning](#), page 308

### 2.1 Fuel Injectors, Removing and Installing

Special tools and workshop equipment required

◆ Injector/Combustion Chamber Seal Tool Set -T10133C-

#### WARNING

- ◆ You must remove the fuse for the fuel pump control module before starting any repairs of the vehicle's fuel system. Failing to do so could result in fire and personal injuries.
- ◆ Do not turn on the ignition, open the front doors, or attempt to start the engine at any time while any part of the vehicle's fuel system is unassembled. Failing to heed this warning could result in fire and personal injury



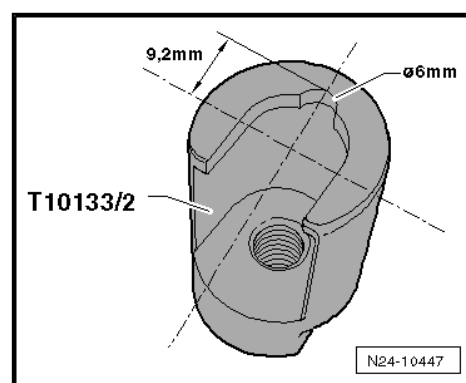
#### Note

*The Injector/Combustion Chamber Seal Tool Set - Puller - T10133/2- was changed and is now identified as Injector/Combustion Chamber Seal Tool Set - Puller -T10133/2A-. If the new tool is still not available, the change can be made by oneself ⇒ [page 301](#) .*

Injector/Combustion Chamber Seal Tool Set - Puller -T10133/2- to Injector/Combustion Chamber Seal Tool Set - Puller - T10133/2A-, Reworking

#### Procedure

- File out the semi-circle using a Round file (approximately 6 mm) as shown in the illustration.

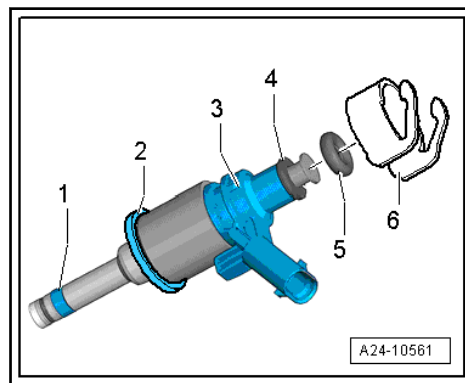


#### Note

*The semi-circle allows the Puller to slide further onto the Fuel Injector. The Puller has more contact surfaces through this.*

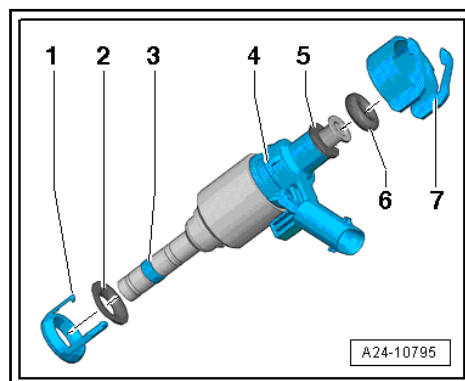
- Mark the modified Puller with an "A" at the end of the tool number.

Fuel Injector, Old Version



- 1 - Combustion chamber seal (Teflon® seal), replacing When installing, the ring must not be greased or handled with any other lubricants.
- 2 - An intermediate ring shall replace the support ring; refer to fuel injector (new version).
- 3 - Fuel injector
- 4 - Spacer ring (replace if damaged)
- 5 - O-ring (replace, coat lightly with clean engine oil when installing)
- 6 - Support ring (via this support ring, the fuel rail utilizes the force to hold the fuel injector in place in the cylinder head).

#### Fuel Injector, New Version



- 1 - Intermediate ring, replace
- 2 - Mount
- 3 - Combustion chamber seal (Teflon® seal), replacing. When installing, the ring must not be greased or handled with any other lubricants.
- 4 - Fuel injector
- 5 - Spacer ring (replace if damaged)
- 6 - O-ring (replace, coat lightly with clean engine oil when installing)
- 7 - Support ring (via this support ring, the fuel rail utilizes the force to hold the fuel injector in place in the cylinder head).

#### Removing

- Remove the intake manifold with the fuel rail. Refer to [M4.2 anifold with Fuel Rail, Removing and Installing](#), page 319 .



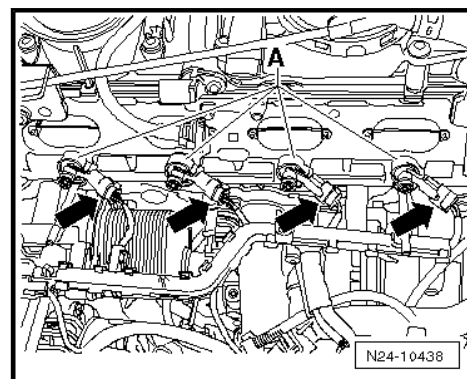


- Cover the intake channels with a clean cloth.

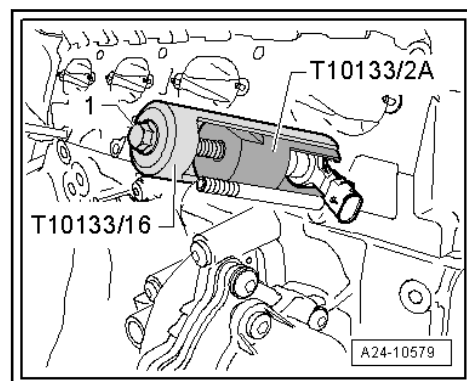
**Note**

*If the Fuel Injectors remain stuck in the fuel rail, these must be carefully taken out of the fuel rail.*

- Remove the support element -A- downward and disconnect the connector -arrows- from the Fuel Injectors.



- Set the Injector/Combustion Chamber Seal Tool Set - Puller -T10133/2A- into the groove on the Fuel Injector.



- Mount the Injector/Combustion Chamber Seal - Removal Tool -T10133/16- and remove the Fuel Injectors by turning the bolt -1-.

**Note**

- ◆ Pay attention to the intermediate ring.
- ◆ If no new Fuel Injectors are installed, the Fuel injectors must be cleaned before installation. Refer to [⇒ I2.3 injectors, Cleaning](#), page 308.
- ◆ The combustion chamber seal (Teflon® seal) must always be replaced before reinstalling the Fuel Injector. Refer to [⇒ I2.2 injector Seals, Replacing](#), page 305.

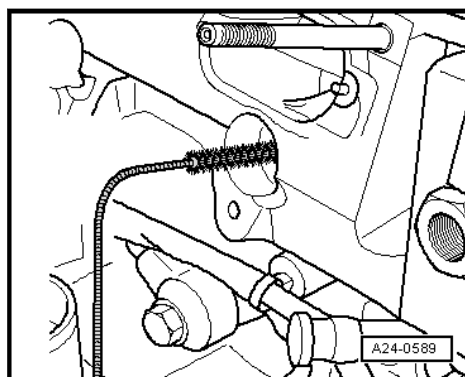


## Installing

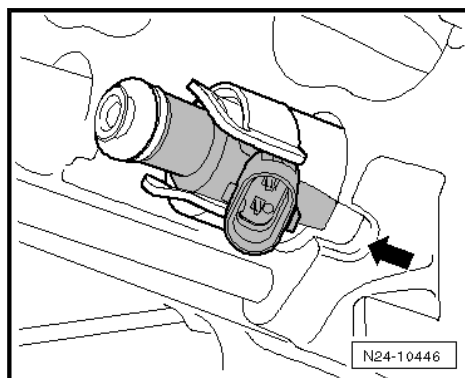


### Note

- ◆ *Combustion chamber sealing ring (Teflon® sealing ring) for the Fuel Injector must not be oiled or greased.*
- ◆ *It is possible an opened intake valve may hinder the cleaning of bores in cylinder head. In this case, the engine must be turned farther by hand using a wrench on the crankshaft.*
- Clean the Fuel Injector holes in the cylinder head thoroughly with the Nylon Brush -T10133/4-.

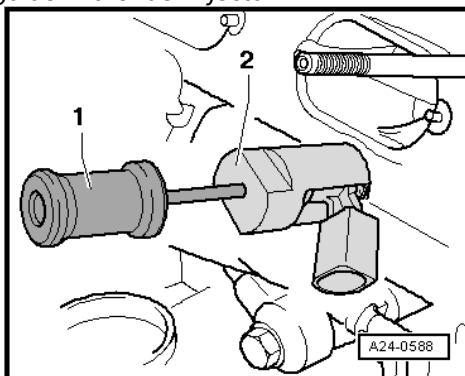


- Replace the combustion chamber seal (Teflon® seal) on the Fuel Injector. Refer to [⇒ 12.2 njector Seals, Replacing", page 305](#).
- Assemble the fuel injector with the parts from the repair kit.
- Press the fuel injector by hand into cylinder head (free of oil and grease) until they stop. Make sure the fuel injectors are positioned correctly -arrow- inside the cylinder head.



**Note**

*If it is difficult to install the fuel injector by hand, use the Injector/Combustion Chamber Seal Tool Set - Puller - T10133/2A- -2- with the Injector/Combustion Chamber Seal Tool Set - Sliding Hammer - T10133/3- to guide in the fuel injector.*



- Install the support ring onto the fuel injector.
- Lightly coat the O-rings for the high pressure fuel injector with clean engine oil.
- Install the intake manifold with the fuel rail. Refer to [⇒ M4.2 anifold with Fuel Rail, Removing and Installing”, page 319](#) .

## 2.2 Fuel Injector Seals, Replacing

### Special tools and workshop equipment required

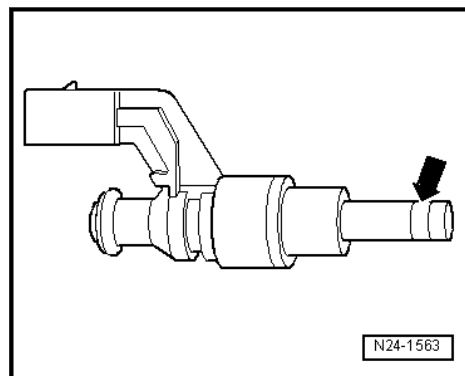
- ◆ Injector/Combustion Chamber Seal Tool Set -T10133C-
- ◆ Brass Brush

### Procedure

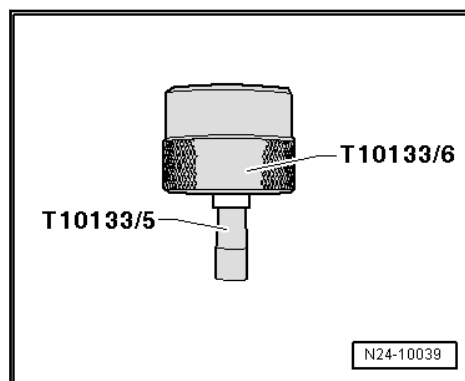
**Note**

*Combustion chamber sealing ring (Teflon® sealing ring) for the Fuel Injector must not be oiled or greased.*

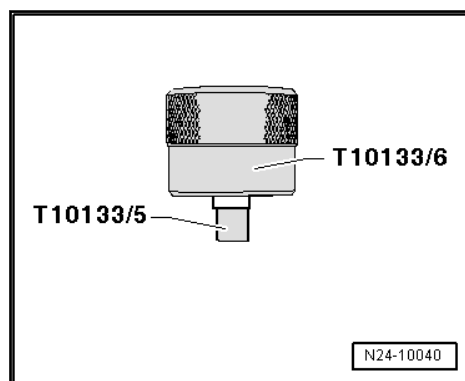
- Clean the Fuel Injectors. Refer to [⇒ I2.3 njectors, Cleaning”, page 308](#) .
- Carefully remove the old combustion chamber seal (Teflon® seal) with the appropriate tool, for example, with cut the seal open with a razor and spread seal open with a small screwdriver and pull it forward and off. When doing this, make sure not to damage the groove -arrow- or the surrounding rib in the groove base.



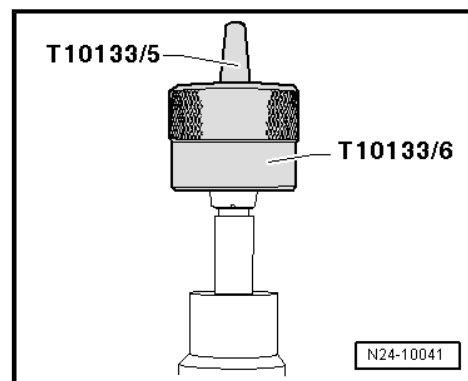
- Carefully clean the Fuel Injector around the groove -arrow- and the base of the groove. Carefully remove any existing deposits (coking) using a Brass Brush.
- Place a new seal on the Injector/Combustion Chamber Seal Tool Set - Assembly Cone -T10133/5-.



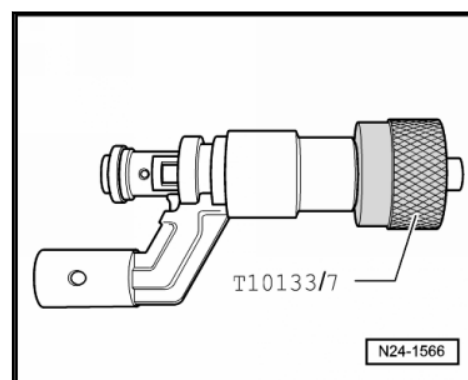
- Slide the seal as far as possible onto the Injector/Combustion Chamber Seal Tool Set - Assembly Cone -T10133/5- using the Injector/Combustion Chamber Seal Tool Set - Assembly Sleeve -T10133/6-.
- Turn the Injector/Combustion Chamber Seal Tool Set - Assembly Sleeve -T10133/6-. Then push the seal until it ends on the Injector/Combustion Chamber Seal Tool Set - Assembly Cone -T10133/5-.



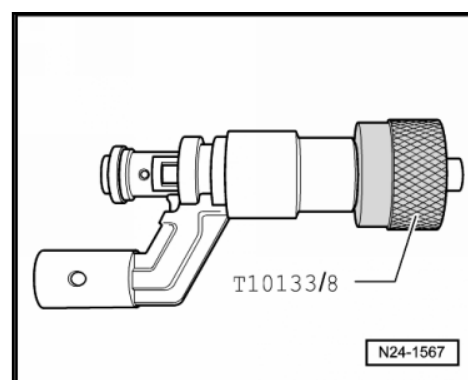
- Place the Injector/Combustion Chamber Seal Tool Set - Assembly Cone -T10133/5- onto the Fuel Injector. Push the seal farther onto the Fuel Injector using the Injector/Combustion Chamber Seal Tool Set - Assembly Sleeve -T10133/6-.



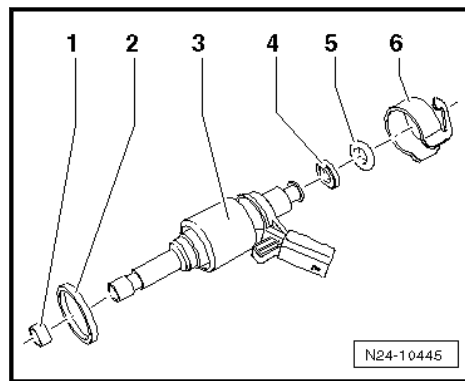
- Remove the Injector/Combustion Chamber Seal Tool Set - Assembly Cone -T10133/5-. Slide the seal up to the groove using the Injector/Combustion Chamber Seal Tool Set - Assembly Sleeve -T10133/6-.
- Press the Injector/Combustion Chamber Seal Tool Set - Calibration Sleeve -T10133/7- with a slight turning motion (approximately 180°) onto the Fuel Injector until it stops.



- Pull off the Injector/Combustion Chamber Seal Tool Set - Calibration Sleeve -T10133/7- again using turning motions in the opposite direction.
- Press the Injector/Combustion Chamber Seal Tool Set - Calibration Sleeve -T10133/8- with a slight turning motion (approximately 180°) onto the Fuel Injector until it stops.



- Pull off the Injector/Combustion Chamber Seal Tool Set - Calibration Sleeve -T10133/8- again using turning motions in the opposite direction.
- Replace the O-ring -5- and support ring -4- on the Fuel Injector.



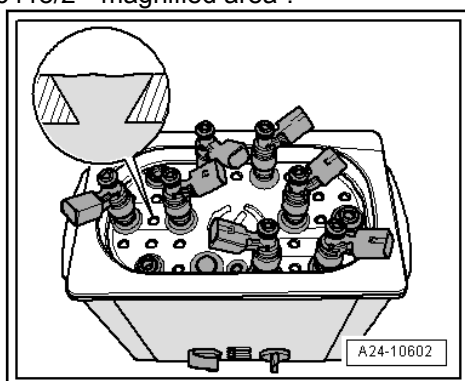
## 2.3 Fuel Injectors, Cleaning

### Special tools and workshop equipment required

- ◆ Ultrasonic Cleaning Unit -VAS6418-
- ◆ Ultrasonic Cleaning Unit - Mounting Plate for Injection Modules -VAS6418/1-
- ◆ Ultrasonic Cleaning Unit - Cleaning Fluid -VAS6418/2-

### Conditions

- The Ultrasonic Cleaning Unit -VAS6418- must be filled to the upper edge of the holes with Ultrasonic Cleaning Unit - Cleaning Fluid -VAS6418/2- -magnified area-.

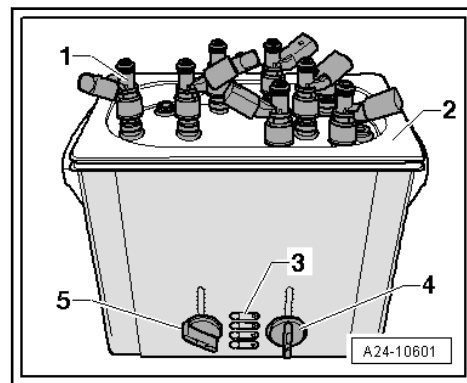


### Note

*Pay attention to the safety precautions and handling instructions for the Ultrasonic Cleaning Device. Refer to Owner's Manual.*

### Procedure

- Remove the Fuel Injectors. Refer to [⇒ I2.1 injectors, Removing and Installing](#), page 301 .
- Install the Fuel Injectors -1- all the way into the Mounting Plate for Injection Modules -VAS6418/1- -2-.



- Dip the Fuel Injectors with the Mounting Plate for Injection Modules -VAS6418/1- into the Ultrasonic Cleaning Unit - Cleaning Fluid -VAS6418/2-.
- Using the knob -4-, set the temperature to 50 °C (122 °F).
- Set a cleaning time on the knob -5- to 30 minutes.
- Switch on the ultrasonic device using the button -3-.

**Note**

*The time begins counting down once the cleaning temperature reaches 50 °C (122 °F).*

- Always replace the combustion chamber seal (Teflon® seal) for each Fuel Injector after cleaning. Refer to [⇒ I2.2 njector Seals, Replacing](#), page 305 .
- Then reinstall the Fuel Injectors. Refer to [⇒ I2.1 njectors, Removing and Installing](#), page 301 .



### 3 Air Filter

⇒ [-3.1 Air Filter Housing", page 310](#)

⇒ [F3.2 ilter Housing, Removing and Installing", page 312](#)

⇒ [F3.3 ilter Element, Removing and Installing", page 314](#)

#### 3.1 Overview - Air Filter Housing



##### Note

*Air filter, removing and installing. Refer to ⇒ [F3.2 ilter Housing, Removing and Installing", page 312](#).*



**1 - Spring Clamp****2 - Air Duct Hose**

- ☐ To the turbocharger
- ☐ Check for secure fit
- ☐ Check for dirt

**3 - Mass Airflow Sensor -G70-**

- ☐ With Intake Air Temperature Sensor 2 -G299-
- ☐ Removing and installing. Refer to [⇒ A5.3 Ir-flow Sensor, Removing and Installing](#), page 337.
- ☐ Bolted to the air filter upper section (3.5 Nm)

**4 - O-Ring**

- ☐ Replace after removing

**5 - Bolts**

- ☐ 1.5 Nm
- ☐ For the air filter housing upper section

**6 - Bolts**

- ☐ 1.5 Nm
- ☐ For the air filter housing upper section

**7 - Air Filter Upper Section**

- ☐ Clean off dirt, leaves and salt residue from the air filter upper section.

**8 - Secondary Air Guide**

Only on engine code CBFA:

- ☐ Check for secure fit
- ☐ To the Secondary Air Injection Pump Motor -V101-

**9 - Filter Element**

- ☐ Always use an original air filter. Refer to the Parts Catalog
- ☐ Note the replacement intervals. Refer to [⇒ Maintenance Intervals; Rep. Gr. 03](#).
- ☐ Removing and installing. Refer to [⇒ F3.3 Filter Element, Removing and Installing](#), page 314.

**10 - Snow Screen**

- ☐ Not installed on all vehicles

**11 - Air Filter Lower Section**

- ☐ Clean off dirt, leaves and salt residue from the air filter lower section

**12 - Water Drain Hose Connection**

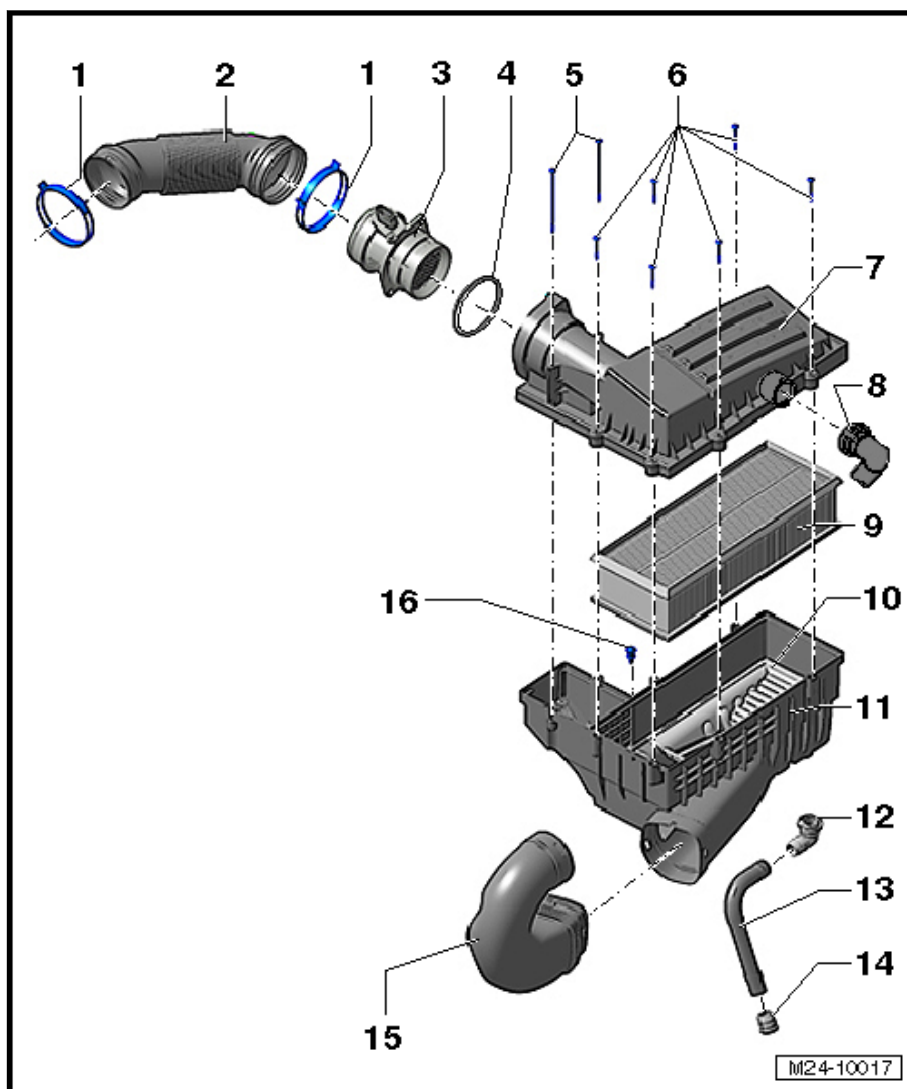
- ☐ Clean the connection

**13 - Water Drain Hose**

- ☐ Clean the water drain hose

**14 - Shutter Valve****15 - Intake Air Duct**

- ☐ From the air duct on the lock carrier





- ☐ Clean dirt and leaves off of the intake air guide

#### 16 - Bolt

- ☐ 8 Nm
- ☐ For the air filter lower section

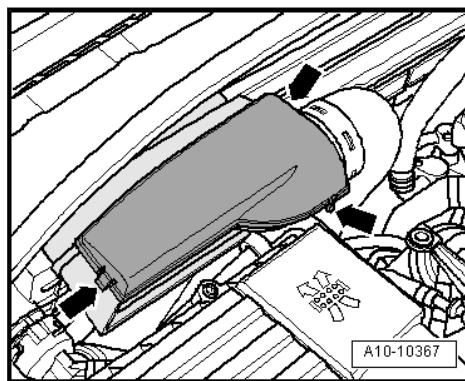
## 3.2 Air Filter Housing, Removing and Installing

### Special tools and workshop equipment required

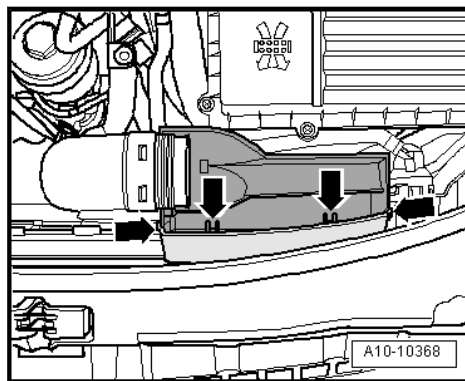
- ◆ Torque Wrench 1783 - 2-10Nm -VAG1783-
- ◆ Spring Clip Pliers

### Removing

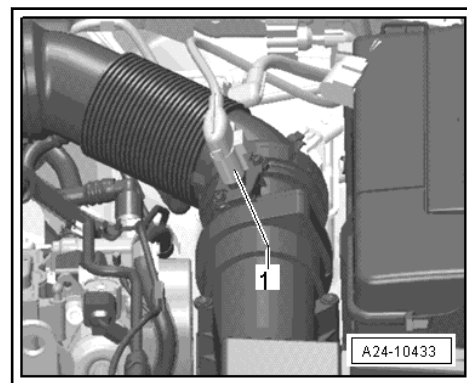
- Disengage the side clips -arrows- and remove the cover for the air duct.



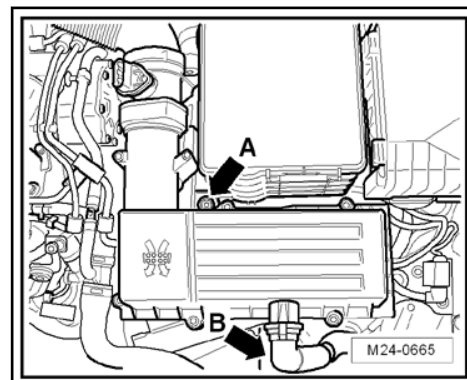
- Disengage the wire retainers -arrows- to unclip the lower air duct.



- Remove the lower air duct with the air duct hose.
- Disconnect the connector -1- from the Mass Airflow Sensor -G70-.



## Engine Code CBFA



- Remove the secondary air pump to the Secondary Air Injection Pump Motor -V101- from the air filter upper section -arrow B-.



### Note

*Press the securing ring to disengage the line.*

### Continuation for All Engine Codes

- Loosen the bolt -arrow A- and pull the air filter housing upward out of the fastener.
- Remove the air filter housing together with the Mass Airflow Sensor -G70- and air duct hose.

### Installing

Install in reverse order of removal. Note the following:

- ◆ The hose connections and the hoses must be free of oil and grease before being installed. Use silicone-free lubricant when installing.
- ◆ Install only approved clamps for securing hose connections. Refer to Parts Catalog.
- Check the Mass Airflow Sensor -G70- and air duct hose (intake air side) for salt residue, dirt and leaves.
- Check the intake air guide for debris.

### Tightening Specification

- ◆ Refer to [⇒ -3.1 Air Filter Housing”, page 310](#)



### 3.3 Air Filter Element, Removing and Installing

#### Special tools and workshop equipment required

- ◆ Torque Wrench 1783 - 2-10Nm -VAG1783-
- ◆ Spring Clip Pliers

#### Removing

##### Engine Code CBFA

- Disconnect the hose leading to the Secondary Air Injection Pump Motor -V101- from the air filter housing.

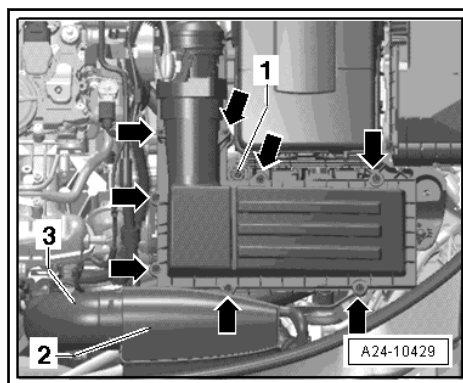


#### Note

*Press the securing ring to disengage the line.*

#### Continuation for All Engine Codes

- Remove the bolts -arrows- from the air filter upper section.
- Lift up the air filter upper section and remove the air filter element.



#### Installing

Install in reverse order of removal. Note the following:

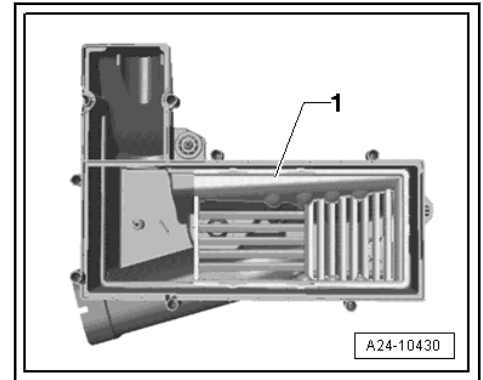
- ◆ If the air filter element is very dirty or soaked, dirt particles or moisture may have contaminated the Mass Airflow Sensor -G70- and may be causing false mass airflow values. This results in reduced performance, since a lower injection quantity is calculated.
- ◆ Always use an original air filter element. Refer to the Parts Catalog.
- ◆ The hose connections and the hoses must be free of oil and grease before being installed. Use silicone-free lubricant when installing.
- ◆ The air filter housing must be clean.
- ◆ Install only approved clamps for securing hose connections. Refer to Parts Catalog.
- ◆ Follow all waste disposal regulations!

Note the following when blowing out the air filter housing with compressed air:

- To prevent malfunctions, cover critical air guided components such as the Mass Airflow Sensor -G70-, air intake pipes, etc. with a clean cloth.

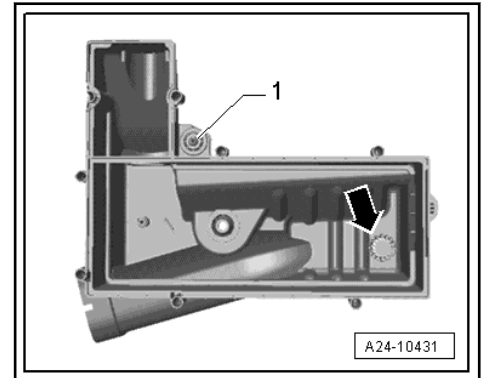


- Check the Mass Airflow Sensor -G70- and air duct hose (intake air side) for salt residue, dirt and leaves.
- Check intake channels up to the air filter insert for dirt. If any contaminants are discovered, clean the air filter housing (upper and lower sections) of salt residue, dirt and leaves (clean by washing or vacuuming, if necessary).
- Check the intake air guide for debris.
- Remove and clean the snow screen -1-.

**Note**

*The snow screen is not installed on all vehicles.*

- Clean the water drain -arrow- and the air filter lower section.



- Make sure the air filter element is properly centered when placed in the mount in the air filter lower section.
- Carefully position the air filter upper section onto the air filter lower section without using force. Make sure the air filter upper section does not sit at an angle on the air filter element (pay attention to the sealing lip on the air filter element).

Further installation is the reverse order of removal.

**Tightening Specification**

- ◆ Refer to [⇒ -3.1 Air Filter Housing](#), page 310



## 4 Intake Manifold

⇒ [4.1 Intake Manifold", page 316](#)

⇒ [M4.2 anifold with Fuel Rail, Removing and Installing", page 319](#)

⇒ [T4.3 hrottle Valve Control Module J338, Removing and Installing", page 327](#)

⇒ [T4.4 hrottle Valve Control Module J338, Cleaning", page 329](#)

⇒ [I4.5 ntake Manifold, Checking", page 330](#)

### 4.1 Overview - Intake Manifold



#### WARNING

The fuel system is under pressure.

Risk of injury from fuel spraying out.

- Wear protective eyewear.
- Wear safety gloves.
- Reduce the pressure: Place clean cloths around the connection point and carefully open the connection point.

**1 - Bolt**

- ☐ 5 Nm
- ☐ For the Intake Air Temperature Sensor -G42-

**2 - Intake Air Temperature Sensor -G42-****3 - EVAP Canister Purge Regulator Valve 1 -N80-**

- ☐ With double check-valve -item 15- [⇒ Item 15 \(page 318\)](#) , a single component
- ☐ To remove and install, remove intake manifold. Refer to [⇒ M4.2 anifold with Fuel Rail, Removing and Installing](#), page 319 .

**4 - Intake Manifold**

- ☐ Removing and installing. Refer to [⇒ M4.2 anifold with Fuel Rail, Removing and Installing](#), page 319 .
- ☐ Fuel rail, separating from the intake manifold. Refer to [⇒ page 326](#)
- ☐ Tightening specification -item 15- [⇒ Item 15 \(page 347\)](#)

**5 - Vacuum Actuator**

- ☐ For variable intake manifold
- ☐ Checking, (refer to [⇒ 14.5 ntake Manifold, Checking](#), page 330 )

**6 - High Pressure Pump Bolts**

- ☐ M6 thread: 8 Nm +90°
- ☐ M8 thread: 20 Nm
- ☐ Replace after removing

**7 - Connection**

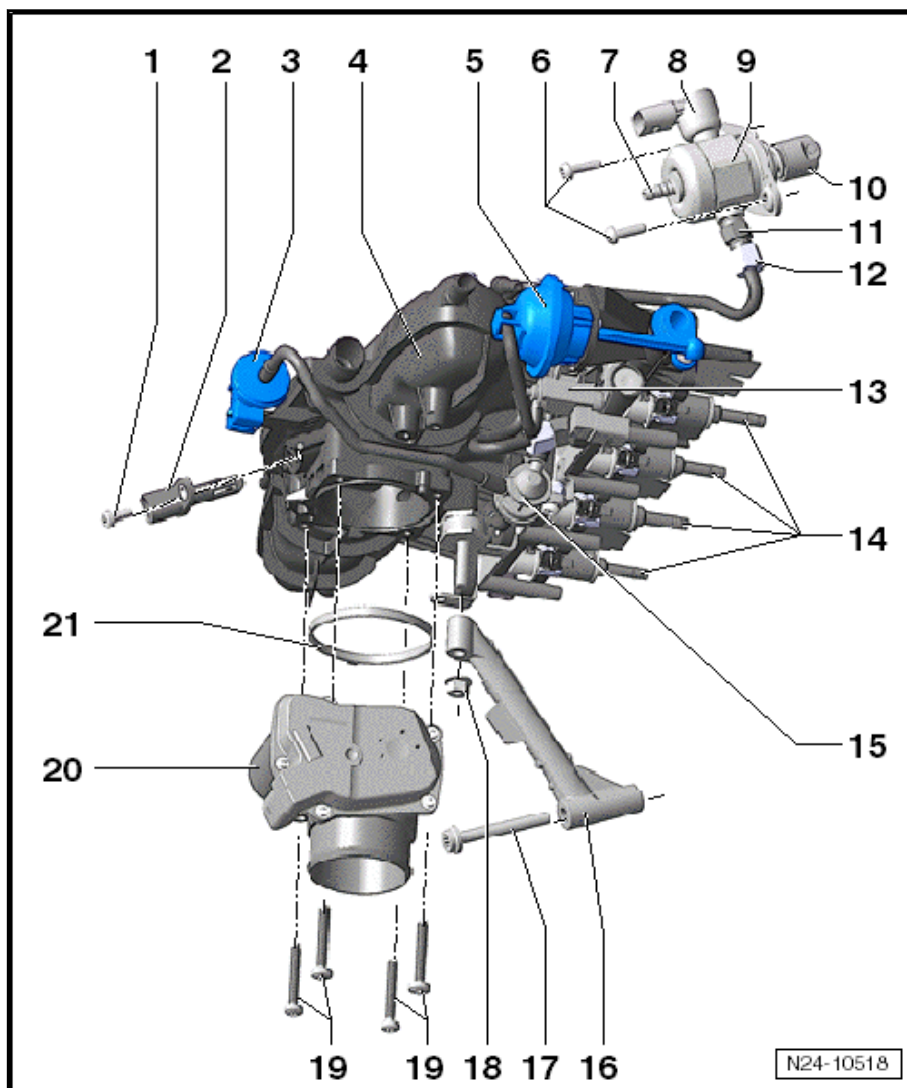
- ☐ For the fuel supply line from the fuel tank

**8 - Fuel Pressure Regulator Valve -N276-**

- ☐ Overview - high pressure pump with Fuel Pressure Regulator Valve -N276-. Refer to [⇒ -7.1 High Pressure Pump](#), page 343 .

**9 - High Pressure Pump**

- ☐ With Fuel Pressure Regulator Valve -N276-
- ☐ There is an electrical Fuel Pump located in the fuel tank, which supplies fuel to the mechanical high pressure pump at a pressure of approximately 7 bar (101.52 psi)
- ☐ When installing the high pressure pump, make sure no dirt enters the fuel system.
- ☐ The fuel system must be pressureless to install the high-pressure pump, releasing fuel pressure. Refer to [⇒ F1.2 uel Pressure, Reducing](#), page 299
- ☐ Install the fuel line to the fuel rail free from tension
- ☐ Overview - high pressure pump with Fuel Pressure Regulator Valve -N276-. Refer to [⇒ -7.1 High Pressure Pump](#), page 343 .





- ☐ Removing and installing. Refer to [⇒ P7.3 ressure Pump, Removing and Installing”, page 347](#) .

#### 10 - Roller Tappet

- ☐ Remains inserted in cylinder head after removing the high-pressure pump, removable

#### 11 - Connection

- ☐ 22 Nm
- ☐ Replace after removing
- ☐ For the high pressure fuel line
- Check the tightening specification for the connection before installing every high pressure fuel line.

#### 12 - High Pressure Fuel Line to the Fuel Rail

- ☐ Union nut: 18 Nm
- For now, tighten the union nut for the high pressure fuel line by hand. Align so it is free of stress.

#### 13 - Intake Manifold Runner Control Valve -N316-

#### 14 - Fuel Injectors

- ☐ Cylinder 1 Fuel Injector -N30-
- ☐ Cylinder 2 Fuel Injector -N31-
- ☐ Cylinder 3 Fuel Injector -N32-
- ☐ Cylinder 4 Fuel Injector -N33-
- ☐ With combustion chamber seal (Teflon® seal), always replace. Refer to [⇒ I2.2 njector Seals, Replac-ing”, page 305](#) .
- ☐ Replace the O-rings.
- ☐ Make sure it is in the installation position
- ☐ Removing and installing. Refer to [⇒ I2.1 njectors, Removing and Installing”, page 301](#) .
- ☐ Cleaning. Refer to [⇒ T4.4 hrottle Valve Control Module J338, Cleaning”, page 329](#) .

#### 15 - Double Check Valve

- ☐ Not installed

#### 16 - Intake Manifold Support

#### 17 - Bolt

- ☐ 23 Nm
- ☐ For the intake manifold support

#### 18 - Nut

- ☐ 10 Nm
- ☐ For the intake manifold support

#### 19 - Bolts

- ☐ 5 Nm
- ☐ For Throttle Valve Control Module -J338-
- ☐ Quantity: 4

#### 20 - Throttle Valve Control Module -J338-

- ☐ Contains
- ◆ EPC Throttle Drive -G186-
- ◆ EPC Throttle Drive Angle Sensor 1 -G187-
- ◆ EPC Throttle Drive Angle Sensor 2 -G188-
  - ☐ After replacing the Throttle Valve Control Module -J338-, it must be adapted to the Engine Control Module -J623- using the Vehicle Diagnostic Tester in “Guided Functions”.
  - ☐ Removing and installing. Refer to [⇒ T4.3 hrottle Valve Control Module J338, Removing and Installing”, page 327](#) .
  - ☐ Cleaning. Refer to [⇒ T4.4 hrottle Valve Control Module J338, Cleaning”, page 329](#) .

#### 21 - Seal





- ☐ Replace after removing
- ☐ The rim of the seal must fit into the groove provided for it inside the intake manifold

## 4.2 Intake Manifold with Fuel Rail, Removing and Installing

### Special tools and workshop equipment required

- ◆ Wrench - Oil Filter -3417-
- ◆ Torx Socket - T30 -T10347-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Elbow Assembly Tool -T10118- (not illustrated)



#### Note

*If the intake manifold is replaced, the Intake Manifold Runner Position Sensor -G336- must be adapted to the Engine Control Module -J623-. Refer to Vehicle Diagnostic Tester "Guided Function".*

Fuel rail, separating from the intake manifold. Refer to [⇒ page 326](#).

### Removing



#### Note

- ◆ *To access the Fuel Injectors, the intake manifold and fuel rail with the air control charge motion valve must be removed.*
- ◆ *The combustion chamber seal (Teflon®) and the O-ring must always be replaced.*
- ◆ *Overview - intake manifold. Refer to [⇒ -4.1 Intake Manifold", page 316](#).*
- ◆ *Overview - fuel rail. Refer to [⇒ -7.2 Fuel Rail with Fuel Injectors", page 345](#).*
- Read the Safety Precautions before starting. Refer to [⇒ P1 recautions", page 1](#).
- Follow the guidelines for clean working conditions. Refer to [⇒ f3.1 or Clean Working Conditions", page 5](#).



#### WARNING

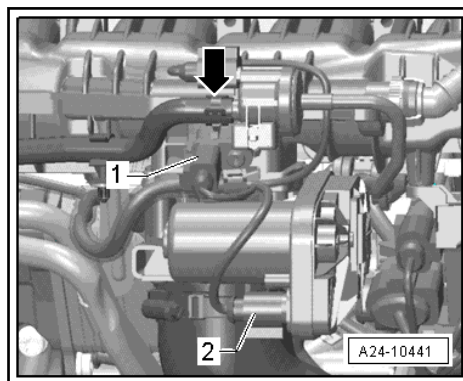
**The fuel system is under pressure.  
Risk of injury from fuel spraying out.**

- Wear protective eyewear.
- Wear safety gloves.
- Reduce the pressure: Place clean cloths around the connection point and carefully open the connection point.

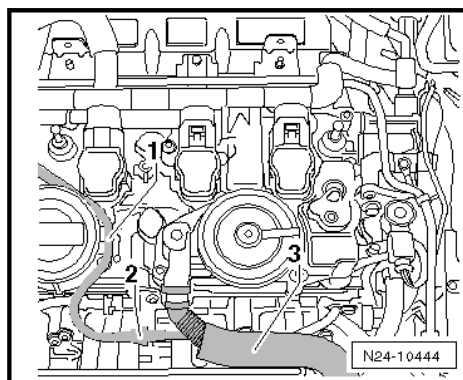
- Remove the engine cover. Refer to [⇒ C3.1 over, Removing and Installing", page 37](#).
- If equipped, remove the charge air guide to the sound generator.



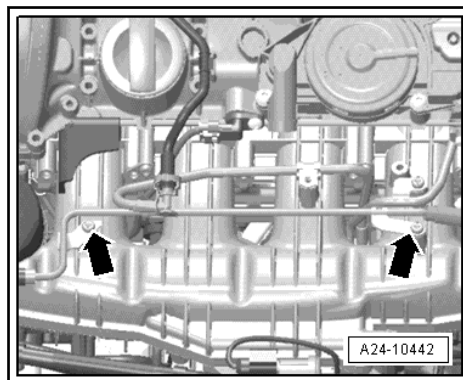
- Clean the transition from the intake manifold to the cylinder head.
- Remove the air filter. Refer to ⇒ [F3.2 ilter Housing, Removing and Installing](#), page 312 .
- Remove the vent line -arrow- from the EVAP canister. Disconnect the connector from the EVAP Canister Purge Regulator Valve 1 -N80-.



- Disconnect the following electrical connectors as well:
  - 1 - Intake Air Temperature Sensor -G42-
  - 2 - Throttle Valve Control Module -J338-
- Disconnect the vacuum line -1- at the separating point -2-. Then remove the crankcase ventilation hose -3-.



- Remove the bolts -arrows- for the fuel supply line and lay the line to the side.



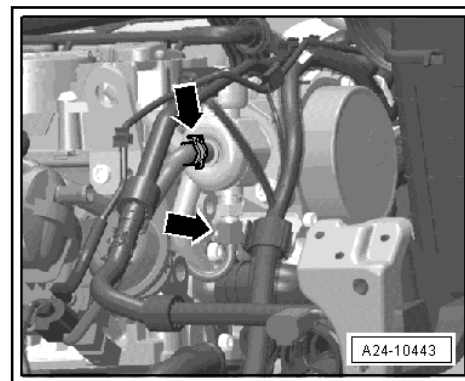


# **WARNING**

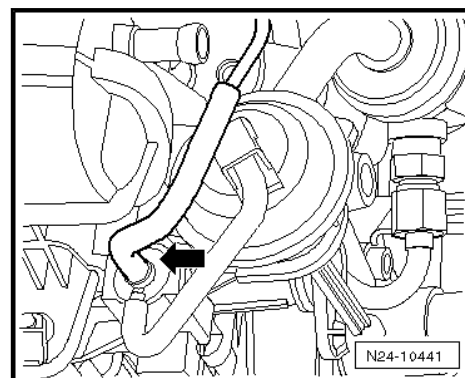
The fuel system is under pressure.

Risk of injury from fuel spraying out.

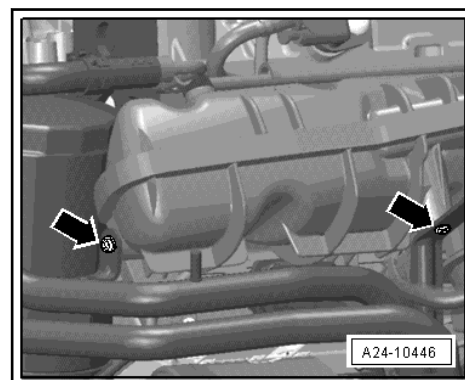
- Wear protective eyewear.
  - Wear safety gloves.
  - Reduce the pressure: Place clean cloths around the connection point and carefully open the connection point.
- 
- Loosen the union nut -lower arrow- on the high pressure fuel line.



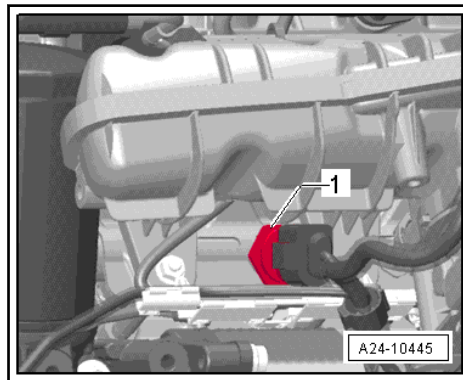
- Disconnect the vacuum line -arrow- from the Intake Manifold Runner Control Valve -N316-.



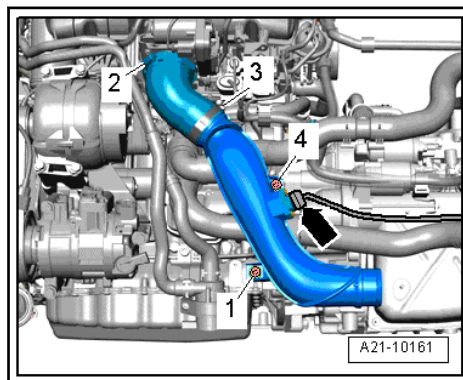
- Remove the bolts -arrows- for the coolant line from the intake manifold.



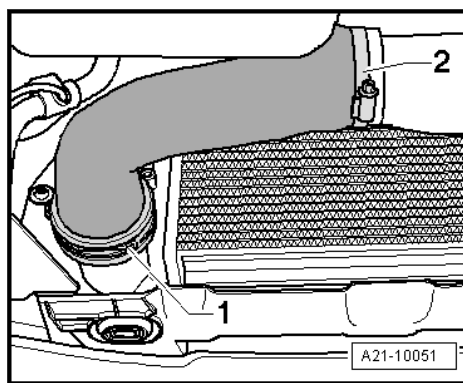
- Release the connector from the Fuel Pressure Sensor - G247- -1- using the Elbow Assembly Tool -T10118- and then remove the connector.



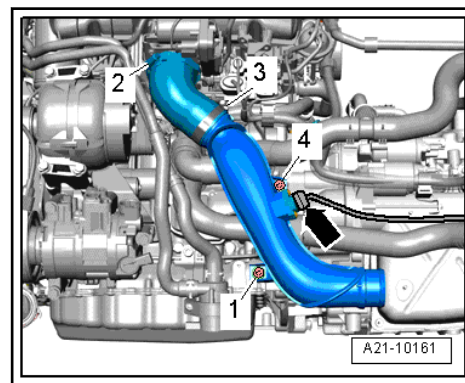
- Loosen the hose clamp -2-.



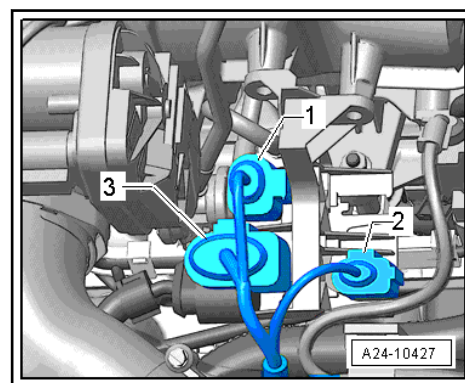
- Remove the bolt -4-.
- Disconnect the connector -arrow-.
- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50; Noise Insulation.
- Disconnect the charge air hose by lifting the clamps -1- and loosening the hose clamp -2-.



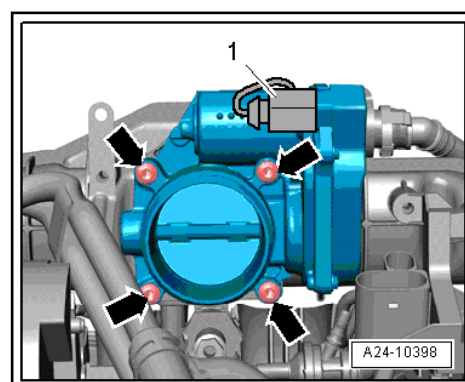
- Seal off the connections on the charge air cooler with a clean cloth.
- Remove the bolt -1- and remove the air duct pipe downward.



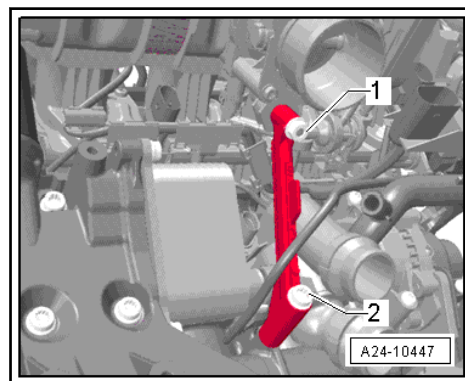
- Disconnect the connectors -1 through 3- and remove the bracket from the intake manifold.



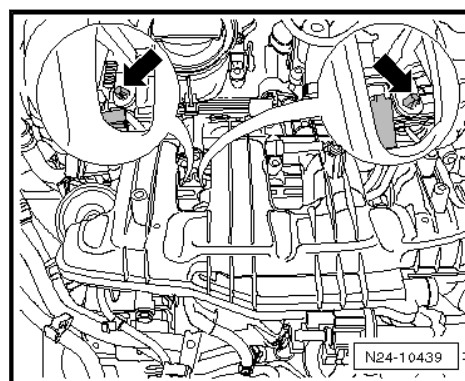
- 1 - From Camshaft Position Sensor -G40-
- 2 - From Knock Sensor 1 -G61-
- 3 - 8-Pin Connector for Fuel Injectors
- Remove the Throttle Valve Control Module -J338- -arrows-.



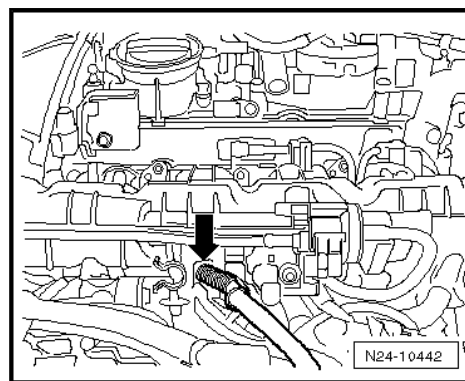
- Remove the intake manifold support by removing the nut -1- and bolt -2-.



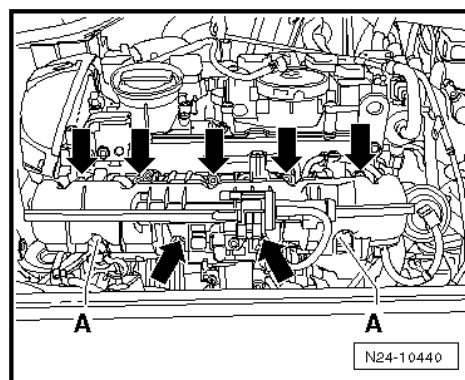
- Remove the oil filter. Refer to ➤ [-3.1 Oil Filter Housing / Oil Pressure Switch F1](#) ", page 206 .
- Loosen the line bracket -arrows-.



- Loosen the line -arrow- from the intake manifold.

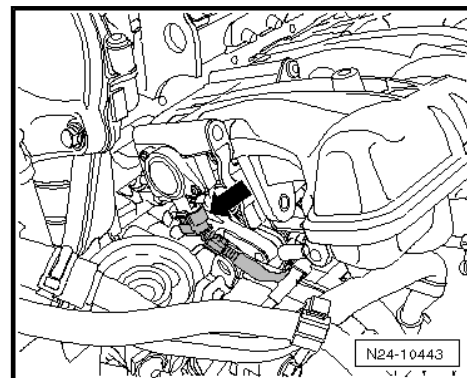


- Remove the nuts -A- and loosen the bolts -arrows- from the intake manifold using the Torx Socket - T30 -T10347-.





- Carefully pull the intake manifold and fuel rail away from the cylinder head just a little.
- Disconnect the connector -arrow- from the Intake Manifold Runner Position Sensor -G336- and remove the intake manifold.



- Cover the intake channels with a clean cloth.

**Note**

*The Fuel Injectors could remain stuck in the fuel rail.*

- Disconnect the fuel rail from the intake manifold. Refer to [⇒ page 326](#).

**Installing****Conditions**

- Fuel Injectors sit inside the cylinder head. Install the Fuel Injectors. Refer to [⇒ I2.1 injectors, Removing and Installing](#), [page 301](#).
- Push the intake manifold over the stud bolts (lower left and right) onto the cylinder head.

**Note**

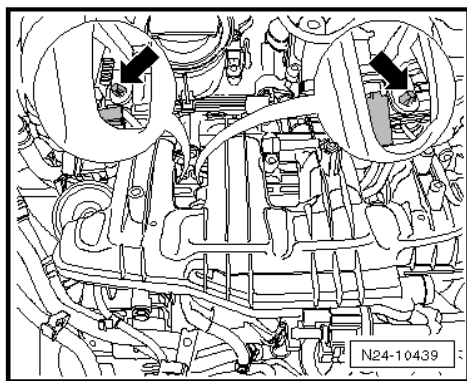
*Make sure the Fuel Injectors are installed correctly and pay attention to the bracket (located under the intake manifold) when mounting the intake manifold.*

- If the intake manifold becomes slightly pulled out during installation work and the Fuel Injectors remain seated in the fuel rail, then the Fuel Injectors must be removed from the fuel rail again and reinserted into the cylinder head.

Install in reverse order of removal. Note the following:

- ◆ When attaching the bracket onto the intake manifold, make sure it clips into both latches.



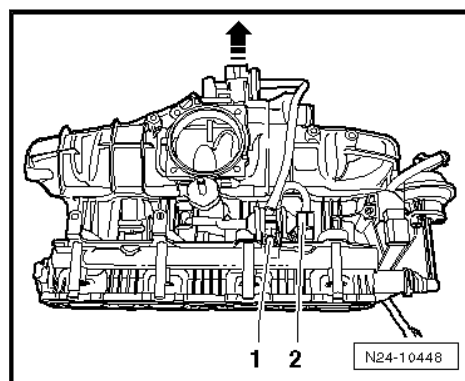


## Fuel Rail, Disconnecting from Intake Manifold

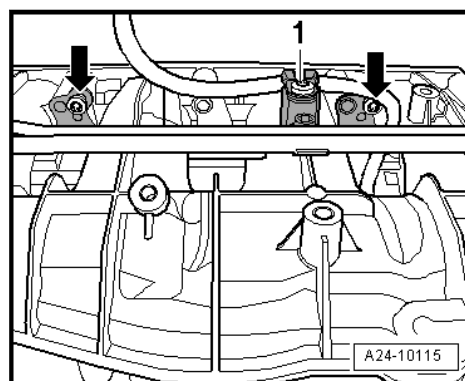
### Conditions

- The intake manifold must be removed. Refer to ⇒ [M4.2 anti-fold with Fuel Rail, Removing and Installing](#), page 319 .

### Separating



- Remove the EVAP Canister Purge Regulator Valve 1 -N80- in direction of -arrow- from the bracket.
- Loosen the double check-valve -1- and the bleed line -2-, if equipped.
- Open the hose clamp -1-.
- Remove both bolts -arrows- from the fuel rail.
- Remove the fuel rail from the intake manifold.



### Installing

Install in reverse order of removal. Note the following:

- Tighten the fuel line.





- Install the intake manifold with the fuel rail. Refer to [⇒ M4.2 anifold with Fuel Rail, Removing and Installing”, page 319](#).

#### Tightening Specification

- ◆ Refer to [⇒ -7.2 Fuel Rail with Fuel Injectors”, page 345](#)
- ◆ Refer to [⇒ -4.1 Intake Manifold”, page 316](#)
- ◆ Refer to [⇒ -7.2 Fuel Rail with Fuel Injectors”, page 345](#)

### 4.3 Throttle Valve Control Module -J338-, Removing and Installing

#### Special tools and workshop equipment required

- ◆ Torque Wrench 1783 - 2-10Nm -VAG1783-

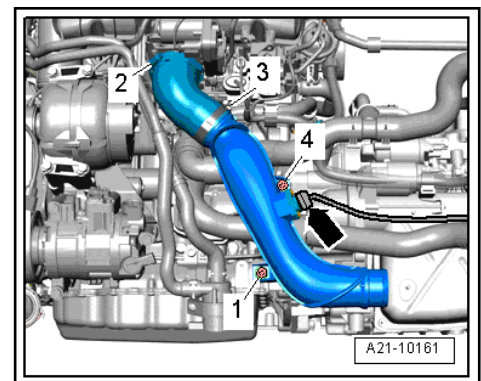
#### Removing



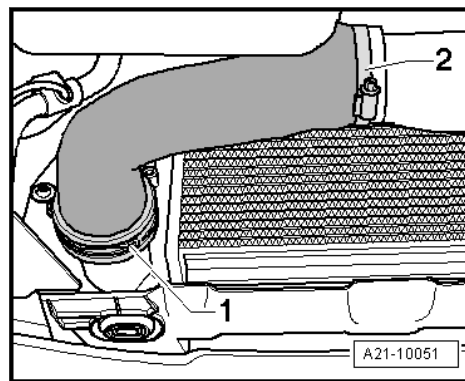
#### Note

*Overview - intake manifold. Refer to [⇒ -4.1 Intake Manifold”, page 316](#).*

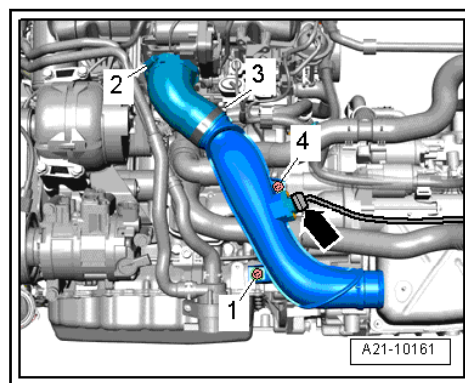
- Follow the guidelines for clean working conditions. Refer to [⇒ f3.1 or Clean Working Conditions”, page 5](#).
- If equipped, remove the charge air guide to the sound generator.
- Loosen the hose clamp -2-.



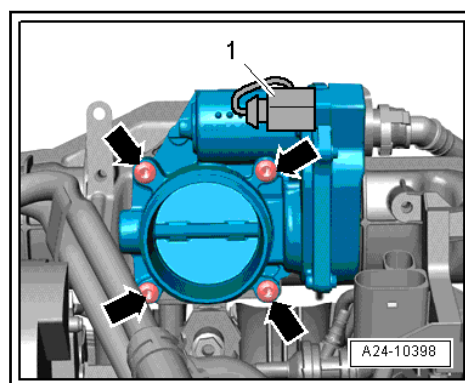
- Remove the bolt -4-.
- Disconnect the connector -arrow-.
- Remove the noise insulation. Refer to [⇒ Body Exterior; Rep. Gr. 50; Noise Insulation](#).
- Disconnect the charge air hose by lifting the clamps -1- and loosening the hose clamp -2-.



- Seal off the connections on the charge air cooler with a clean cloth.
- Remove the bolt -1- and remove the air duct pipe downward.



- Disconnect the connector -1- at the Throttle Valve Control Module -J338-.
- Remove the bolts -arrows- and remove the Throttle Valve Control Module -J338-.



## Installing

Install in reverse order of removal. Note the following:

- Clean the gasket sealing surface.
- Replace the seal.
- The position indicator on the seal must fit into the groove provided for it inside the intake manifold.
- If the Throttle Valve Control Module -J338- was replaced, the Engine Control Module must be adapted to the Throttle Valve Control Module -J338-. Refer to Vehicle Diagnostic Tester "Guided Function".



### Tightening Specification

- ◆ Refer to [⇒ -4.1 Intake Manifold", page 316](#)
- ◆ Refer to [⇒ -2.2 Charge Air System", page 283](#)

## 4.4 Throttle Valve Control Module -J338-, Cleaning

### Special tools and workshop equipment required

- ◆ Acetone

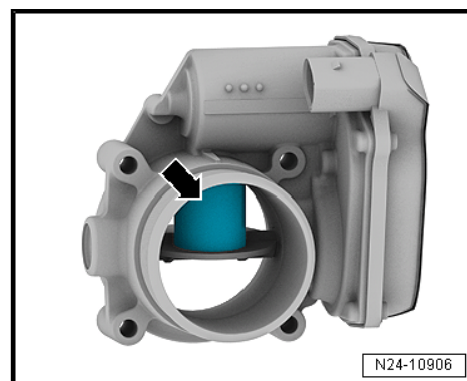


### Note

- ◆ *If a new Engine Control Module is installed, then the Throttle Valve Control Module must be adapted. The adaptation may only be performed on a new or cleaned Throttle Valve Control Module because dirt/coke on the end position of the throttle can result in incorrect adaptation values.*
- ◆ *The throttle valve connections must not be scratched when cleaning.*

### Procedure

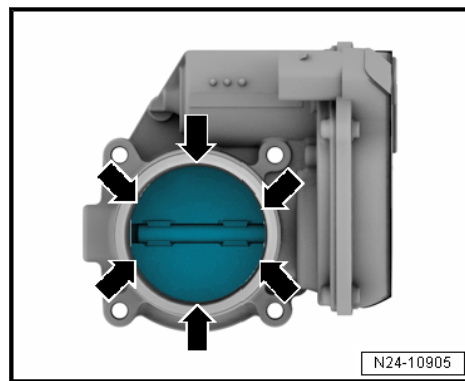
- Follow the guidelines for clean working conditions. Refer to [⇒ f3.1 or Clean Working Conditions", page 5](#).
- Remove the Throttle Valve Control Module. Refer to [⇒ T4.3 Throttle Valve Control Module J338, Removing and Installing", page 327](#).
- Open the throttle valve by hand. Then block the throttle valve when it is opened with a suitable object (for example plastic or wooden wedge) -arrow-.



### WARNING

Risk of injury from acetone. Acetone is highly flammable and can cause eye and skin irritation.

- Wear protective eyewear.
  - Wear safety gloves.
- 
- Clean the throttle valve connections, especially near the closed throttle valve, with a standard acetone and a brush.



- Wipe the throttle valve connections with a lint-free cloth.
- Allow the acetone to dry completely and reinstall the cleaned Throttle Valve Control Module. Refer to [⇒ T4.3 Throttle Valve Control Module J338, Removing and Installing](#), page 327 .
- Adapt the Engine Control Module to the Throttle Valve Control Module -J338-. Refer to Vehicle Diagnostic Tester “Guided Function”.

## 4.5 Variable Intake Manifold, Checking

### Special tools and workshop equipment required

- ◆ Hand Vacuum Pump -VAS6213-



#### Note

*Only perform this test if there is a loss of torque. That means there is reduced elasticity or reduced engine acceleration.*

### Test Conditions

- The Intake Manifold Runner Control Valve -N316- was checked with the Vehicle Diagnostic Tester and is OK.

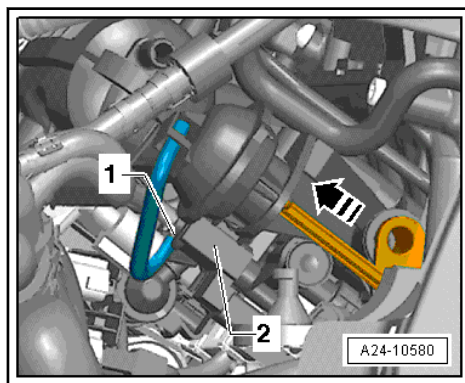
### Test Sequence



#### Note

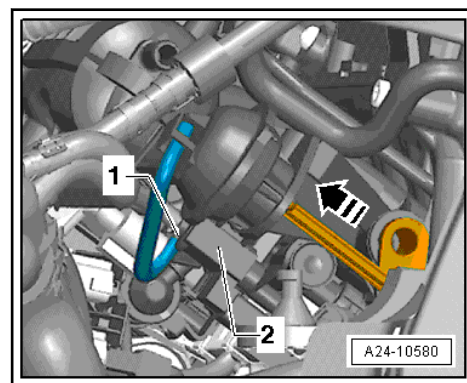
*Overview - fuel rail. Refer to [⇒ -7.2 Fuel Rail with Fuel Injectors](#), page 345 .*

- Remove the engine cover. Refer to [⇒ C3.1 Cover, Removing and Installing](#), page 37 .
- Start engine and let run at idle.
- Have a second technician increase the engine speed abruptly (press accelerator pedal).
- Watch the vacuum actuator for the intake manifold change-over.
- The vacuum actuator must activate in direction of -arrow-.

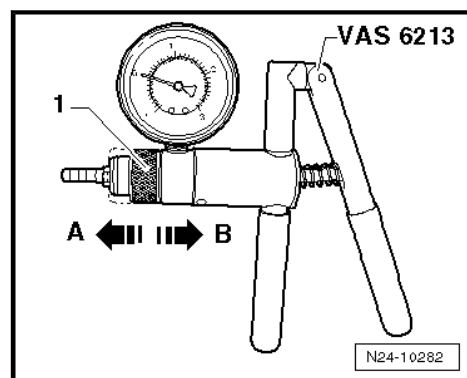


If change-over does not function as specified:

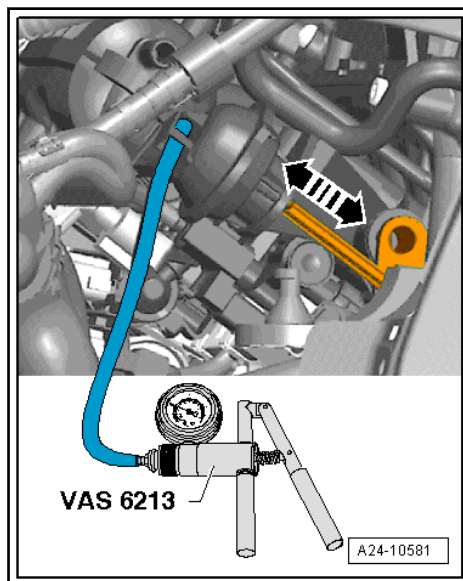
- Check the vacuum system for leaks.
- The change-over mechanism can move easily. Check this by operating the linkage by hand.
- Check the vacuum lines for correct connection.
- Check that the vacuum hoses are not porous.
- Remove the vacuum hose -1- to the intake manifold change-over vacuum actuator on the Intake Manifold Runner Control Valve -N316- -2-.



- Set the slide ring -1- on the Hand Vacuum Pump -VAS6213- in position -A- for "vacuum".



- Connect the Hand Vacuum Pump -VAS6213- to the intake manifold change-over vacuum actuator.



- Operate the Hand Vacuum Pump -VAS6213- several times.
- The vacuum actuator must move in direction of -arrows-.

If the vacuum actuator does not move:

- Replace the vacuum actuator.



## 5 Sensors

⇒ [F5.1 uel Pressure Sensor G247, Removing and Installing", page 333](#)

⇒ [F5.2 uel Pressure Sensor G247, Checking", page 334](#)

⇒ [A5.3 inflow Sensor, Removing and Installing", page 337](#)

### 5.1 Fuel Pressure Sensor -G247-, Removing and Installing

Special tools and workshop equipment required

- ◆ Elbow Assembly Tool -T10118-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Double Hexagon Socket - 27mm -VAS5301/7-

Removing



Note

Overview - fuel rail. Refer to ⇒ [-7.2 Fuel Rail with Fuel Injectors", page 345](#).

- Read the Safety Precautions before starting. Refer to ⇒ [P1 recautions", page 1](#).
- Follow the guidelines for clean working conditions. Refer to ⇒ [f3.1 or Clean Working Conditions", page 5](#).

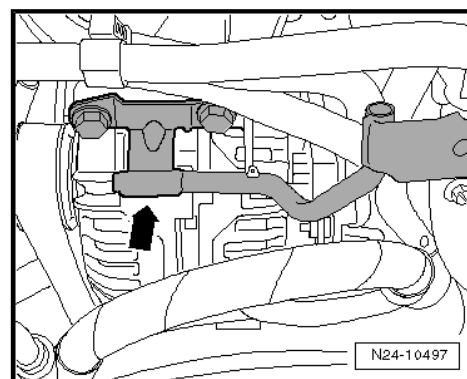


#### WARNING

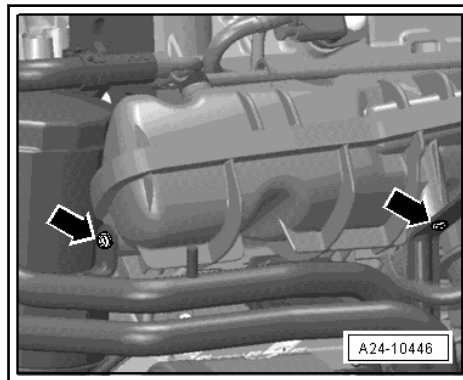
The fuel system is under pressure.

Risk of injury from fuel spraying out.

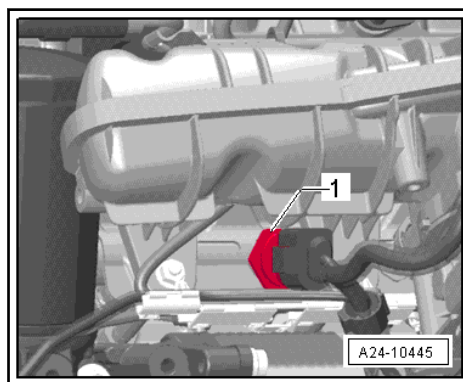
- Wear protective eyewear.
  - Wear safety gloves.
  - Reduce the pressure: Place clean cloths around the connection point and carefully open the connection point.
- If equipped, remove the charge air guide to the sound generator.
  - Remove the bracket -arrow- on the top of the Generator -C-.



- Remove the bolts -arrows- for the coolant line from the intake manifold.



- Use the Elbow Assembly Tool -T10118- -1- to release the connector from the Fuel Pressure Sensor -G247-. Then remove the connector.
- Remove the Fuel Pressure Sensor -G247- using the Double Hexagon Socket - 27mm -VAS5301/7-.
- Collect escaping fuel with a cleaning cloth.



### Installing

Install in reverse order of removal. Note the following:

- ◆ Coat the Fuel Pressure Sensor -G247- sealing point with clean engine oil and install it in the fuel rail.

### Tightening Specification

- ◆ Refer to [⇒ -3.1 Coolant Pipes”, page 249](#)
- ◆ Refer to [⇒ -7.2 Fuel Rail with Fuel Injectors”, page 345](#)

## 5.2 Fuel Pressure Sensor -G247-, Checking

### Special tools and workshop equipment required

- ◆ Elbow Assembly Tool -T10118-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Vehicle Diagnostic Tester
- ◆ Pressure Sensor Tester - Adapter 1 -VAS6394/1- with Pressure Sensor Tester - Adapter 2 -VAS6394/2-
- ◆ Double Hexagon Socket - 27mm -VAS5301/7-
- ◆ Vehicle Diagnostic Tester - Test Adapter - 3 Pin -VAS5570-
- ◆ Vehicle Diagnostic Tester





## Test Sequence



### Note

Overview - fuel rail. Refer to [⇒ -7.2 Fuel Rail with Fuel Injectors](#), page 345.

- Read the Safety Precautions before starting. Refer to [⇒ P1 recautions](#), page 1.
- Follow the guidelines for clean working conditions. Refer to [⇒ f3.1 or Clean Working Conditions](#), page 5.

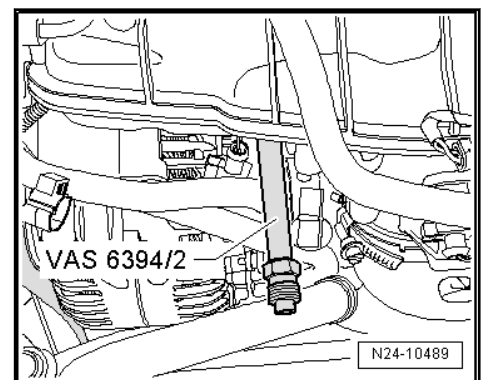


### WARNING

The fuel system is under pressure.

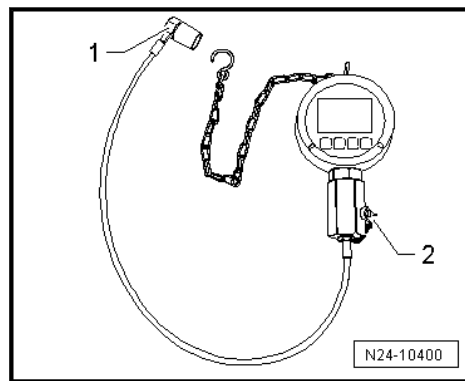
Risk of injury from fuel spraying out.

- Wear protective eyewear.
  - Wear safety gloves.
  - Reduce the pressure: Place clean cloths around the connection point and carefully open the connection point.
- 
- Remove the engine cover. Refer to [⇒ C3.1 over, Removing and Installing](#), page 37.
  - Remove the Fuel Pressure Sensor -G247-. Refer to [⇒ F5.1 uel Pressure Sensor G247, Removing and Installing](#), page 333.
  - Coat the sealing point on the Pressure Sensor Tester - Adapter 2 -VAS6394/2- with clean engine oil and install in the fuel rail.



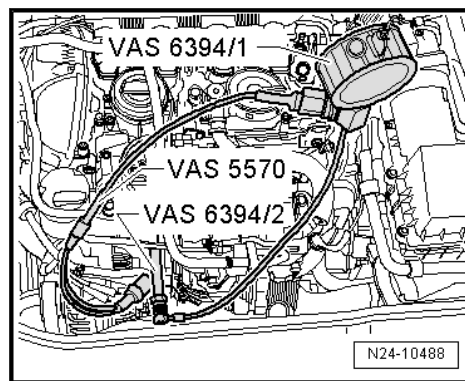
Tightening specification: 27 Nm

- Remove the plug -2-. Screw the Fuel Pressure Sensor -G247- into the Pressure Sensor Tester - Adapter 1 - VAS6394/1-.

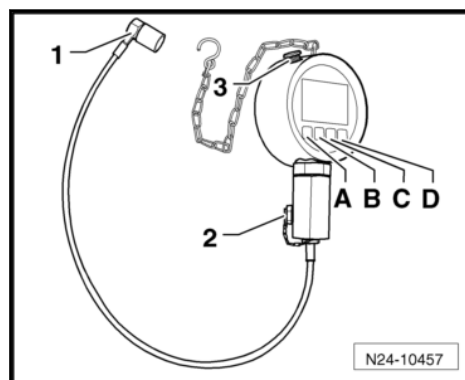


Tightening specification: 27 Nm

- Connect the pressure line from the Pressure Sensor Tester - Adapter 1 -VAS6394/1- to the Pressure Sensor Tester - Adapter 2 -VAS6394/2-.
- Connect the Fuel Pressure Sensor and the Fuel Pressure Sensor connector using Vehicle Diagnostic Tester - Test Adapter - 3 Pin -VAS5570-.

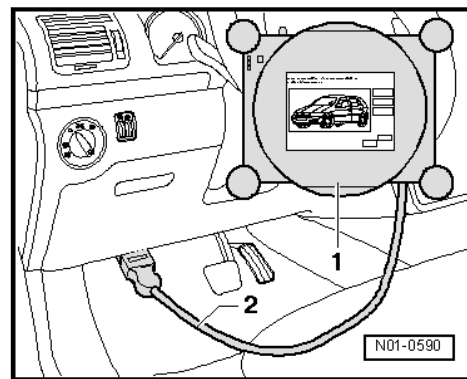


- Switch on the Pressure Sensor Tester - Adapter 1 - VAS6394/1-. To do this, quickly press the button -A- once.



#### Note

- ♦ Holding the button -A- for two seconds switches on the illumination for 20 seconds.
  - ♦ If the Pressure Sensor Tester - Adapter 1 -VAS6394/1- does not display 0 bar, it must be set back to zero. Refer to Owner's Manual.
- Connect the Vehicle Diagnostic Tester -1- as follows:



- Connect the diagnostic cable connector -2- to the data link connector inside the driver footwell.
- Switch the ignition on.
- Select the following buttons consecutively on the display:

**OBD**

**01 - engine electronics** ▶

**011 - measured values** ▶

- Select the measured values block **1 4 0** and quit with **Q**.

Display field 3 shows the fuel pressure actual value as measured by the Fuel Pressure Sensor -G247-.

- Start engine and let run at idle.
- Compare the pressure displayed on the Pressure Sensor Tester - Adapter 1 -VAS6394/1- with the actual value displayed on the Vehicle Diagnostic Tester.
- The pressures may have a maximum difference of 5 bar (72.5 psi).

The Pressure Sensor Tester - Adapter 1 -VAS6394/1- is under high fuel pressure! Disconnect the connector from the Fuel Pressure Sensor -G247- while the engine is still running. This reduces the pressure to approximately 6 bar (87 psi). Switch off the ignition. Place a cleaning cloth around the Fuel Pressure Sensor -G247-. Then loosen the Fuel Pressure Sensor -G247- carefully and release any remaining pressure.

Difference greater than 5 bar (72.5 psi):

- Replace the Fuel Pressure Sensor -G247-.
- Repeat the test with the new Fuel Pressure Sensor -G247- and compare both values.

If the measured values do not match again:

- Perform the line test using “Guided Fault Finding”. Refer to Vehicle Diagnostic Tester.

## 5.3 Mass Airflow Sensor, Removing and Installing

### Special tools and workshop equipment required

- ◆ Spring Clip Pliers

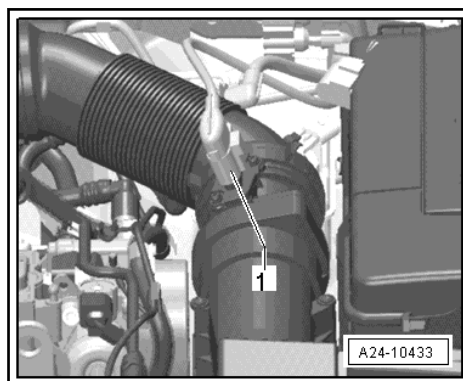


#### Note

*The Intake Air Temperature Sensor 2 -G299- and the Mass Airflow Sensor -G70- are integrated in one housing.*

#### Removing

- Disconnect the connector -1- from the Mass Airflow Sensor -G70-.



- Remove the air duct hose from the Mass Airflow Sensor -G70-.
- Remove both bolts on the Mass Airflow Sensor -G70-. Carefully remove Mass Airflow Sensor -G70- from air filter upper section guide.

#### Installing

For problem-free operation of the Mass Airflow Sensor -G70- it is very important to observe the following notes and procedures.



#### Note

- ♦ *If the air filter element is very dirty or soaked, dirt particles or moisture may have contaminated the Mass Airflow Sensor -G70- and may be causing false mass airflow values. This results in reduced performance, since a lower injection quantity is calculated.*
- ♦ *Always use an original air filter element. Refer to the Parts Catalog.*
- ♦ *Use silicone-free lubricant to mount the intake hose.*
- ♦ *The hose connections and the hoses must be free of oil and grease before being installed.*
- ♦ *Install only approved clamps for securing hose connections. Refer to Parts Catalog.*
- Check the Mass Airflow Sensor -G70- and air duct hose (intake air side) for salt residue, dirt and leaves.
- Check intake channels up to the air filter insert for dirt. If any contaminants are discovered, clean the air filter housing (upper and lower sections) of salt residue, dirt and leaves (clean by washing or vacuuming, if necessary). Removing and installing the air filter. Refer to [⇒ F3.3 Iiter Element, Removing and Installing](#), page 314 .

The rest of the installation is the reverse order of removal.

- Replace the O-ring.



- Tighten the bolts.

#### **Tightening Specification**

- ◆ Refer to [⇒ -3.1 Air Filter Housing", page 310](#)



## 6 Engine Control Module

⇒ E6.1 Engine Control Module J623, Removing and Installing,  
page 340

### 6.1 Engine Control Module -J623-, Removing and Installing

Perform the Following Work

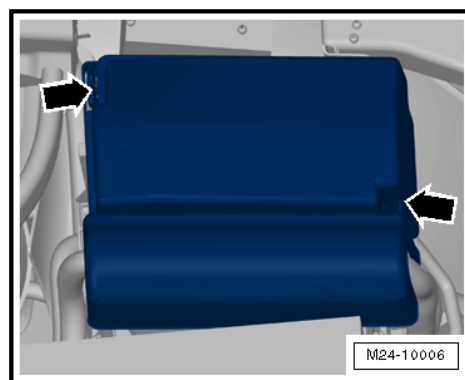


#### Note

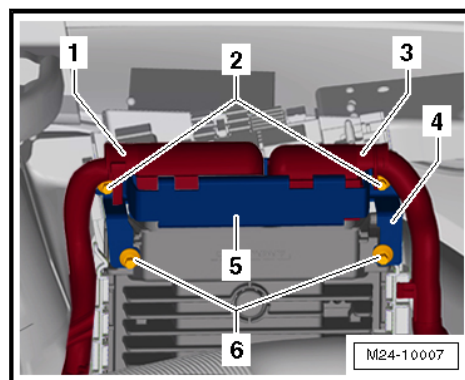
*If it is necessary to replace the engine control module, connect the Vehicle Diagnostic Tester and perform "Replace control module" function.*

#### Removing

- Switch off the ignition.
- Remove the E-box cover inside the engine compartment -arrows-.



#### Vehicles with Anti-Theft Protection



- Disconnect the threaded connection -2-.
- Remove the locking mechanism -5-.
- Disconnect the connectors -1 and 3- from the engine control module.

Only if the engine control module is replaced:

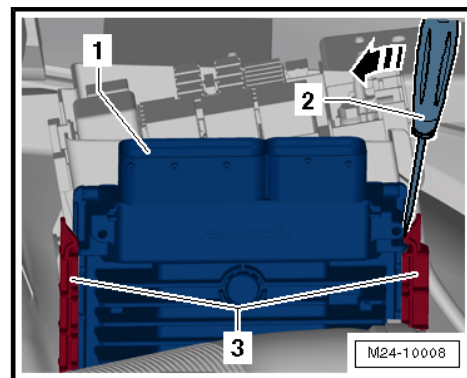
- Remove the threaded connections -6- and the bracket -4-.



### Vehicles without Anti-Theft Protection

- Disconnect the connectors -1 and 2- -3- from the engine control module.

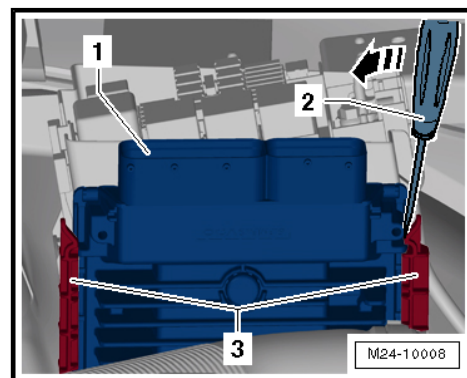
### Continuation for All Vehicles



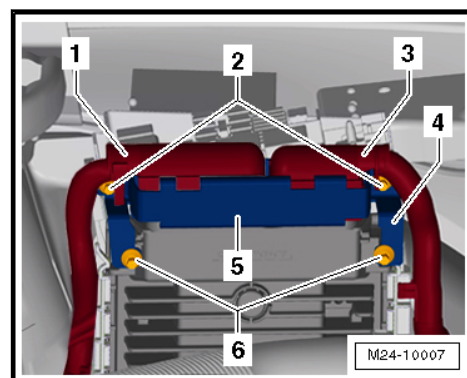
- Push the tabs on the side guides -3- carefully toward the outside with a screwdriver -2-.
- Remove the engine control module -1- from the guides -3-.

### Installing

- Install the engine control module -1- into the guides -3- until it locks.



### Vehicles with Anti-Theft Protection



- Attach the bracket -4- to the engine control module with the shear bolts -6-.
- Tighten the shear bolts -6- just enough until the bolt head breaks off.
- Connect the connectors -1 and 3- to the engine control module.

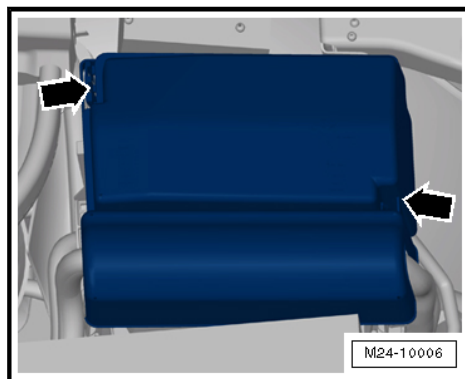


- Install the locking mechanism -5- with shear bolts -2-.
- Tighten the shear bolts -2- until the bolt heads break off.

#### Vehicles without Anti-Theft Protection

- Connect the connectors -1 and 3- to the engine control module.

#### Continuation for All Vehicles



- Install the E-box cover -arrows-.





## 7 High Pressure Pump

⇒ [-7.1 High Pressure Pump", page 343](#)

⇒ [-7.2 Fuel Rail with Fuel Injectors", page 345](#)

⇒ [P7.3 ressure Pump, Removing and Installing", page 347](#)

### 7.1 Overview - High Pressure Pump



#### WARNING

The fuel system is under pressure.

Risk of injury from fuel spraying out.

- Wear protective eyewear.
- Wear safety gloves.
- Reduce the pressure: Place clean cloths around the connection point and carefully open the connection point.



### 1 - Roller Tappet

- ❑ Remains inserted in cylinder head after removing the high-pressure pump, removable

### 2 - O-Ring

- ❑ Replace after removing

### 3 - High Pressure Pump

- ❑ There is an electrical Fuel Pump located in the fuel tank, which supplies fuel to the mechanical high pressure pump at a pressure of approximately 7 bar (101.52 psi)
- ❑ When installing the high pressure pump, make sure no dirt enters the fuel system.
- ❑ The fuel system must be pressureless to install the high-pressure pump, releasing fuel pressure. Refer to [F1.2 uel Pressure, Reducing", page 299](#)
- ❑ Install the fuel line to the fuel rail free from tension
- ❑ Removing and installing. Refer to [P7.3 re-ssure Pump, Removing and Installing", page 347](#).

### 4 - Fuel Pressure Regulator Valve -N276-

### 5 - Bore in the Cylinder Head

- ❑ For high pressure pump

### 6 - Fuel Injector

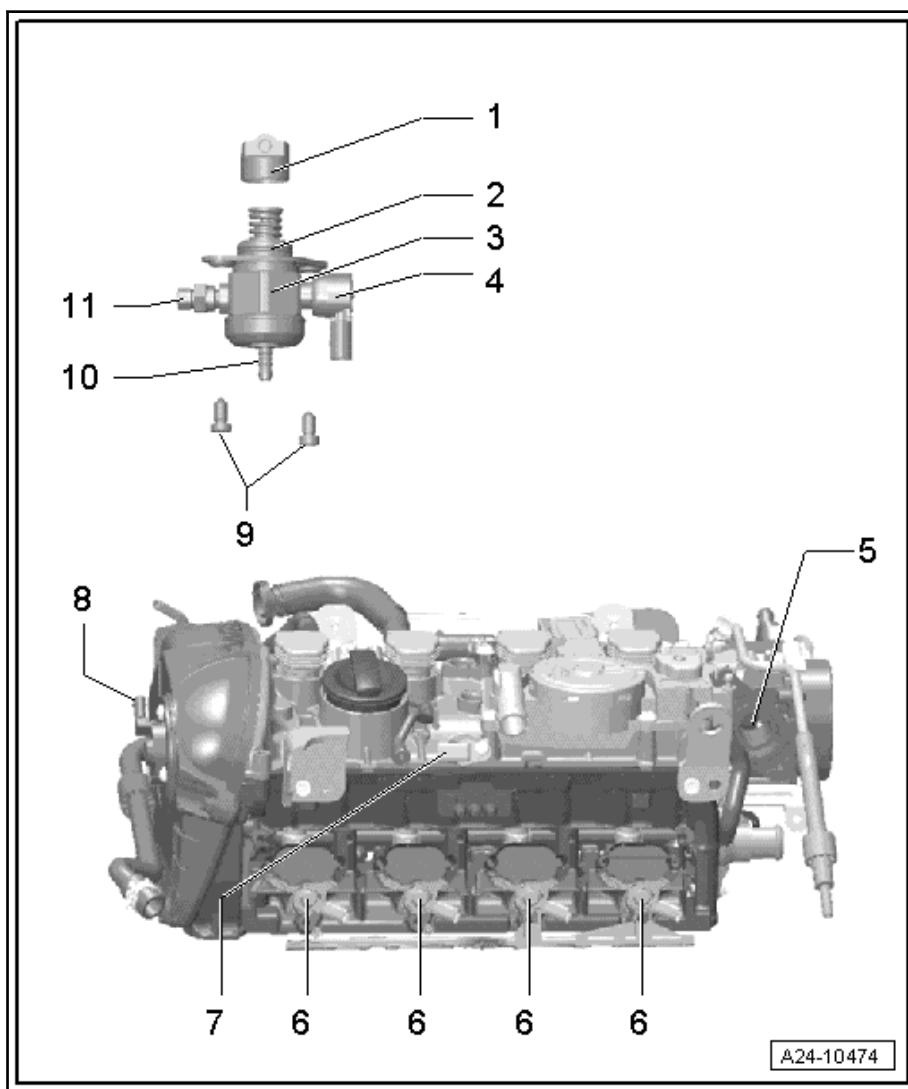
- ❑ Cylinder 1 Fuel Injector -N30-
- ❑ Cylinder 2 Fuel Injector -N31-
- ❑ Cylinder 3 Fuel Injector -N32-
- ❑ Cylinder 4 Fuel Injector -N33-
- ❑ With combustion chamber seal (Teflon® seal), always replace. Refer to [I2.2 njector Seals, Replacing", page 305](#).
- ❑ Replace the O-rings.
- ❑ Make sure it is in the installation position
- ❑ Removing and installing. Refer to [I2.1 njectors, Removing and Installing", page 301](#).
- ❑ Cleaning. Refer to [I2.3 njectors, Cleaning", page 308](#).

### 7 - Camshaft Position Sensor -G40-

- ❑ Bolted on the front cylinder head cover. Refer to [Fig. "" Camshaft Position Sensor -G40- -1- """, page 370](#)

### 8 - Camshaft Adjustment Valve 1 -N205-

- ❑ Removing and installing. Refer to [C4.4 amshaft Adjustment Valve 1 N205, Removing and Installing", page 169](#).



**9 - High Pressure Pump Bolts**

- ☐ M6 thread: 8 Nm +90°
- ☐ M8 thread: 20 Nm
- ☐ Replace after removing

**10 - Connection**

- ☐ For the fuel supply line
- ☐ From the Fuel Tank

**11 - Connection**

- ☐ 22 Nm
- ☐ Replace after removing
- ☐ For the high pressure fuel line to the fuel rail

## 7.2 Overview - Fuel Rail with Fuel Injectors

**WARNING**

The fuel system is under pressure.

Risk of injury from fuel spraying out.

- Wear protective eyewear.
- Wear safety gloves.
- Reduce the pressure: Place clean cloths around the connection point and carefully open the connection point.



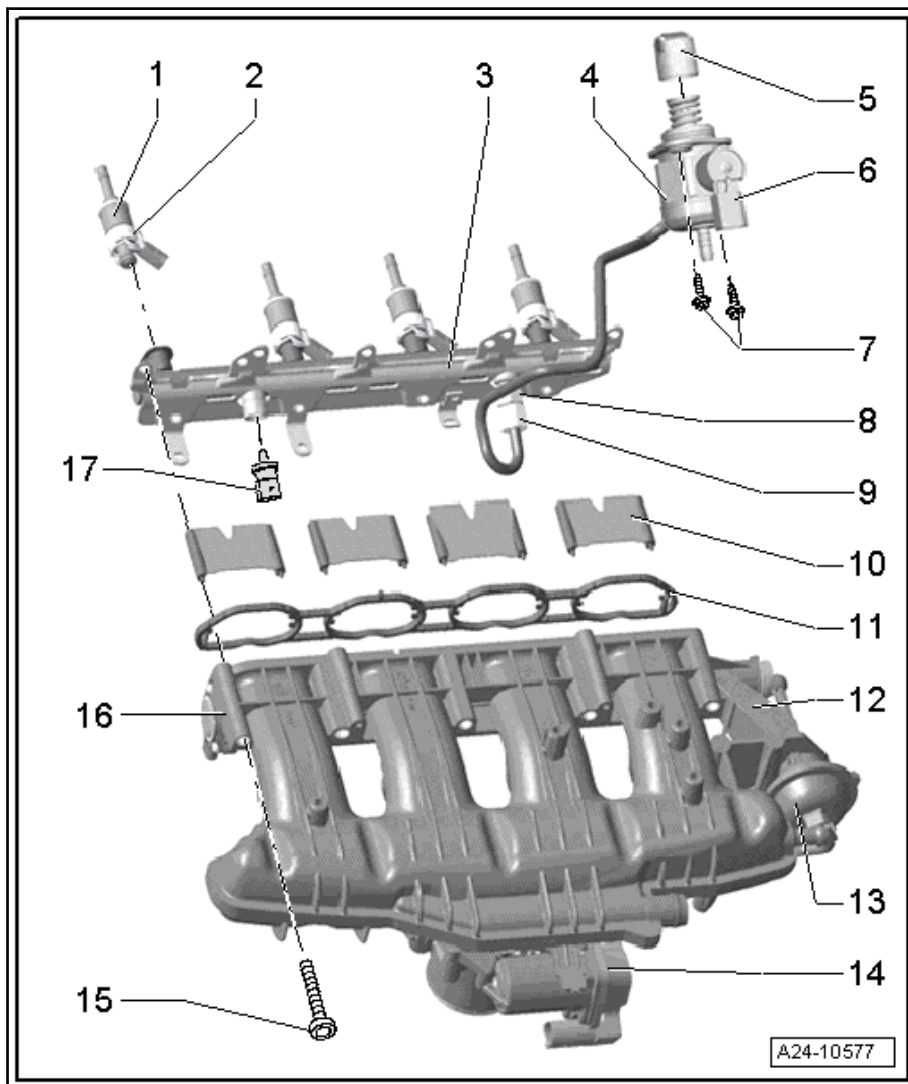
**1 - Fuel Injector**

- ☐ Cylinder 1 Fuel Injector  
-N30-
- ☐ Cylinder 2 Fuel Injector  
-N31-
- ☐ Cylinder 3 Fuel Injector  
-N32-
- ☐ Cylinder 4 Fuel Injector  
-N33-
- ☐ With combustion chamber seal (Teflon® seal), always replace. Refer to ⇒ [12.2 njector Seals, Replacing](#), page 305 .
- ☐ Replace the O-rings.
- ☐ Make sure it is in the installation position
- ☐ Removing and installing. Refer to ⇒ [12.1 njectors, Removing and Installing](#), page 301 .
- ☐ Cleaning. Refer to ⇒ [12.3 njectors, Cleaning](#), page 308 .

## 2 - Support Ring

### 3 - Fuel Rail

- ❑ Removing and installing. Refer to ⇒ [M4.2 anifold with Fuel Rail, Removing and Installing](#), page 319 .
- ❑ Fuel rail, separating from the intake manifold. Refer to ⇒ [page 326](#)



#### 4 - High Pressure Pump

- ❑ There is an electrical Fuel Pump located in the fuel tank, which supplies fuel to the mechanical high pressure pump at a pressure of approximately 7 bar (101.52 psi)
- ❑ When installing the high pressure pump, make sure no dirt enters the fuel system.
- ❑ The fuel system must be pressureless to install the high-pressure pump, releasing fuel pressure. Refer to ⇒ [F1.2 Fuel Pressure, Reducing”, page 299](#)
- ❑ Install the fuel line to the fuel rail free from tension
- ❑ Overview - high pressure pump with Fuel Pressure Regulator Valve -N276-. Refer to ⇒ [-7.1 High Pressure Pump”, page 343](#) .
- ❑ Removing and installing. Refer to ⇒ [P7.3 Pressure Pump, Removing and Installing”, page 347](#) .

## 5 - Roller Tappet

- ☐ Remains inserted in cylinder head after removing the high-pressure pump, removable

## 6 - Fuel Pressure Regulator Valve -N276-

- ❑ Overview - high pressure pump with Fuel Pressure Regulator Valve -N276-. Refer to ⇒ [-7.1 High Pressure Pump](#), page 343 .

## 7 - High Pressure Pump Bolts

- ☐ M6 thread: 8 Nm +90°
- ☐ M8 thread: 20 Nm
- ☐ Replace after removing

## 8 - Connection



- ☐ 22 Nm
- ☐ Replace after removing
- ☐ For the high pressure fuel line
- Check the tightening specification for the connection before installing every high pressure fuel line.

### 9 - High Pressure Fuel Line

- ☐ Union nut: 18 Nm
- For now, tighten the union nut for the high pressure fuel line by hand. Align so it is free of stress.

### 10 - Intake Manifold Flaps

#### 11 - Seal

- ☐ Replace after removing

#### 12 - Intake Manifold

- ☐ Removing and installing. Refer to [⇒ M4.2 anifold with Fuel Rail, Removing and Installing](#), page 319 .

#### 13 - Vacuum Actuator

- ☐ For variable intake manifold
- ☐ Checking intake manifold change-over, (refer to [⇒ I4.5 ntake Manifold, Checking](#), page 330 ),

#### 14 - Throttle Valve Control Module -J338-

- ☐ Contains
- ◆ EPC Throttle Drive -G186-
- ◆ EPC Throttle Drive Angle Sensor 1 -G187-
- ◆ EPC Throttle Drive Angle Sensor 2 -G188-
- ☐ After replacing the Throttle Valve Control Module -J338-, it must be adapted to the Engine Control Module -J623- using the Vehicle Diagnostic Tester in "Guided Functions".
- ☐ Removing and installing. Refer to [⇒ T4.3 hrottle Valve Control Module J338, Removing and Installing](#), page 327 .
- ☐ Cleaning. Refer to [⇒ T4.4 hrottle Valve Control Module J338, Cleaning](#), page 329 .

#### 15 - Intake Manifold Bolts

- ☐ Tighten to 3 Nm, and then tighten to 9 Nm

#### 16 - Intake Manifold Runner Position Sensor -G336-

- ☐ To remove and install, remove intake manifold. Refer to [⇒ M4.2 anifold with Fuel Rail, Removing and Installing](#), page 319 .

#### 17 - Fuel Pressure Sensor -G247-

- ☐ 27 Nm
- ☐ Coat the threads with clean engine oil.
- ☐ Checking. Refer to [⇒ F5.2 uel Pressure Sensor G247, Checking](#), page 334 .
- ☐ Removing and installing. Refer to [⇒ F5.1 uel Pressure Sensor G247, Removing and Installing](#), page 333 .

## 7.3 High Pressure Pump, Removing and Installing

### Special tools and workshop equipment required

- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Spring Clip Pliers

### Removing

### Conditions

- The engine is cold.



## Note

- ◆ *Overview - high pressure pump with Fuel Pressure Regulator Valve -N276-. Refer to [⇒ -7.1 High Pressure Pump-, page 343](#).*
- ◆ *The high pressure pump can only be removed and installed when the engine is cold.*
- ◆ *Pay attention when installing the high pressure pump, that no dirt enters the fuel system.*
- ◆ *Collect escaping fuel with a cleaning cloth.*
- ◆ *Always replace the O-ring and the connection.*
- ◆ *Always install the high pressure fuel lines so that they are free of tension.*

## Procedure

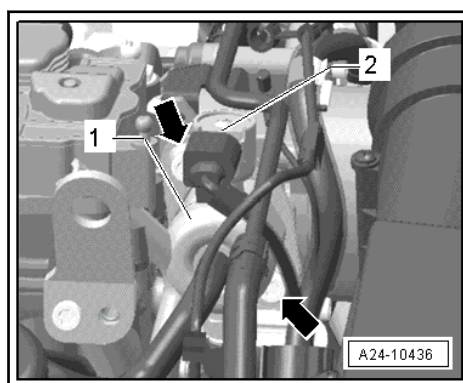
- Read the Safety Precautions before starting. Refer to [⇒ P1 recautions-, page 1](#).
- Follow the guidelines for clean working conditions. Refer to [⇒ f3.1 or Clean Working Conditions-, page 5](#).



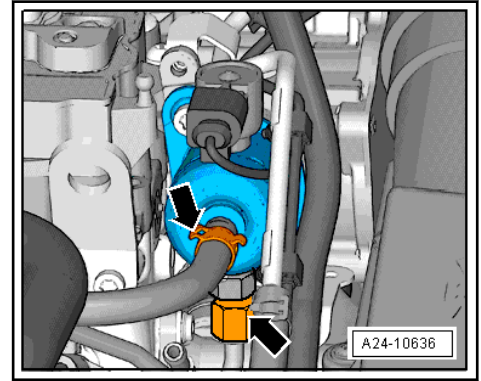
## WARNING

The fuel system is under pressure.  
Risk of injury from fuel spraying out.

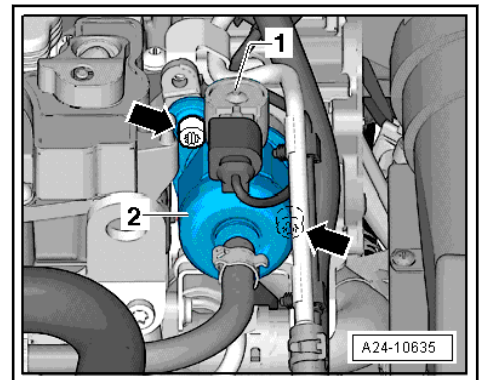
- Wear protective eyewear.
  - Wear safety gloves.
  - Reduce the pressure: Place clean cloths around the connection point and carefully open the connection point.
- 
- Remove the engine cover. Refer to [⇒ C3.1 over, Removing and Installing-, page 37](#).
  - Disconnect the connector -2- from the Fuel Pressure Regulator Valve -N276-.



- Open both fuel lines -arrows-.



- Remove the two bolts -arrows-.



- Carefully remove the high pressure pump. The roller tappet may stay in the cylinder head.

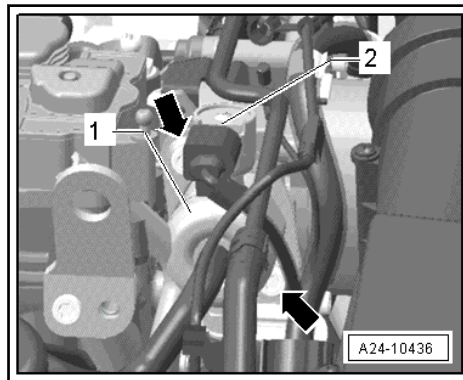
### Installing

#### Note

- ◆ *To insert the high pressure pump, the roller tappet must be at its lowest point.*
- ◆ *If the same or a used high pressure pump is installed, replace the fuel supply line connections (high pressure side). Overview - high pressure pump -item 11- => [Item 11 \(page 345\)](#).*

Install in reverse order of removal. Note the following:

- ◆ Pay attention when installing the high pressure pump, that no dirt enters the fuel system.
- ◆ The O-ring must always be replaced.
- ◆ Always install the high pressure fuel line so that it is free of tension.
- Replace the O-ring for the high pressure pump.
- Insert the roller tappet into the vacuum pump (check the roller tappet beforehand for damage).
- Rotate the crankshaft until the roller tappet is at the lowest point.
- Insert the high pressure pump into the vacuum pump.
- Tighten the bolts -arrows- hand-tight.



- Replace the high pressure pump connections.
- Now tighten the bolts -arrows- diagonally to the required tightening specification.
- Tighten the fuel supply line union nut by hand, »align it without tension« and then tighten it.
- Reconnect the connector -2- for the Fuel Pressure Regulator Valve -N276-.
- If the fuse was pulled, insert it again.
- Check the fuel system for leaks.

#### **Tightening Specification**

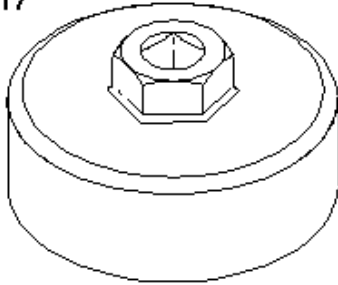
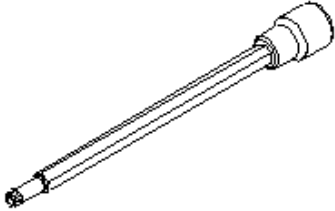

- ◆ Refer to [⇒ -4.1 Intake Manifold”, page 316](#)
- ◆ Refer to [⇒ -7.1 High Pressure Pump”, page 343](#)



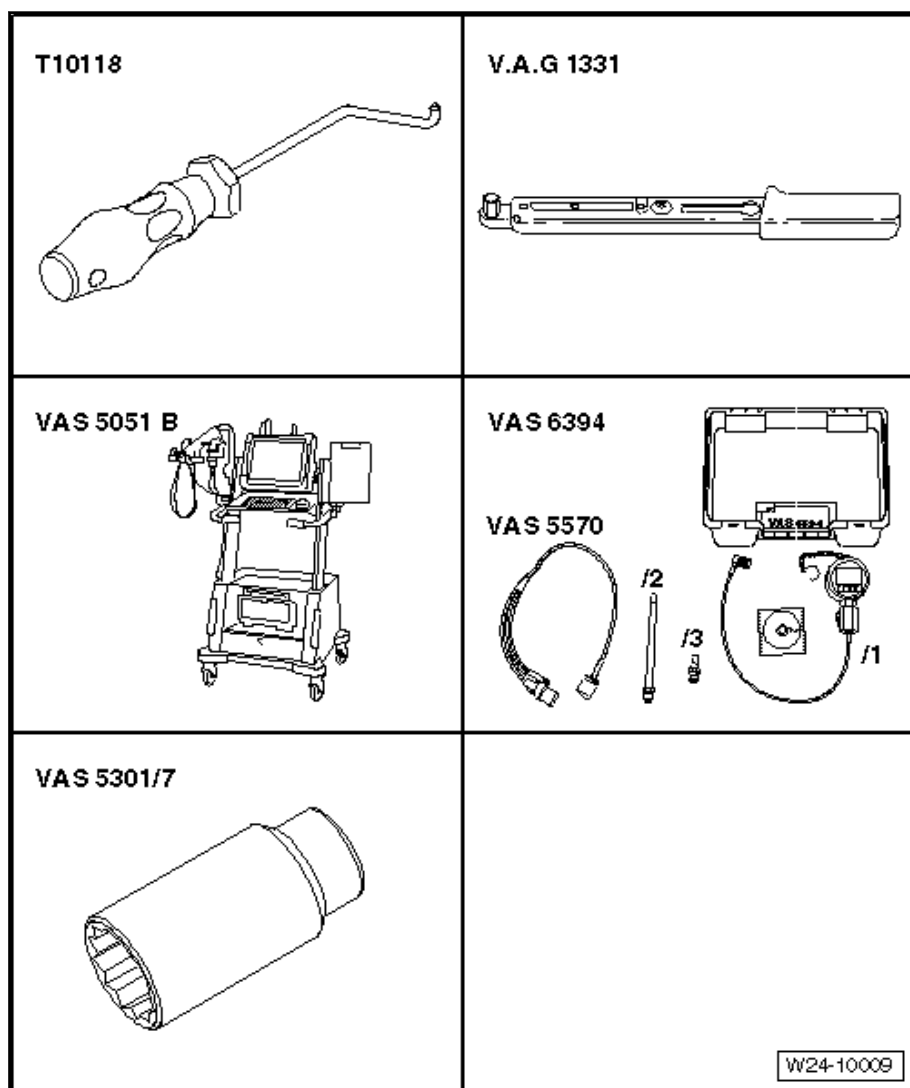


## 8 Special Tools

Special tools and workshop equipment required

|   |  |
|---|--|
| <p><b>3417</b></p>         | <p><b>T10347</b></p>  |
| <p><b>V.A.G 1331</b></p>  |  |
|   | <p>W24-10007</p>   |

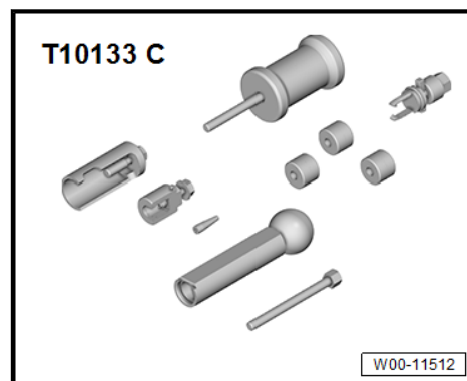
- ◆ Wrench - Oil Filter -3417-
- ◆ Torx Socket - T30 -T10347-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Elbow Assembly Tool -T10118- (not illustrated)



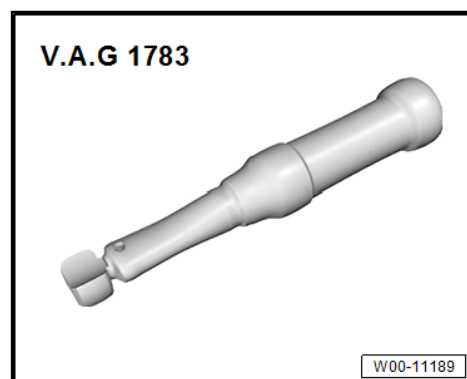
- ◆ Elbow Assembly Tool -T10118-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Vehicle Diagnostic Tester
- ◆ Pressure Sensor Tester - Adapter 1 -VAS6394/1- with Pressure Sensor Tester - Adapter 2 -VAS6394/2-
- ◆ Double Hexagon Socket - 27mm -VAS5301/7-
- ◆ Vehicle Diagnostic Tester - Test Adapter - 3 Pin -VAS5570-
- ◆ Vehicle Diagnostic Tester



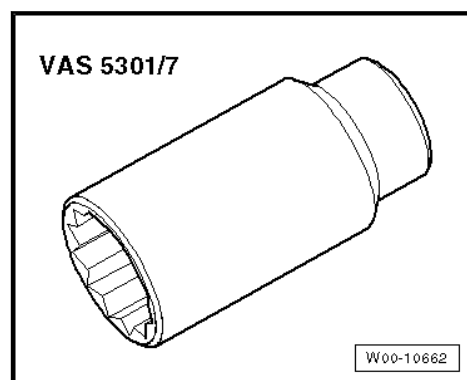
- ◆ Injector/Combustion Chamber Seal Tool Set -T10133C-



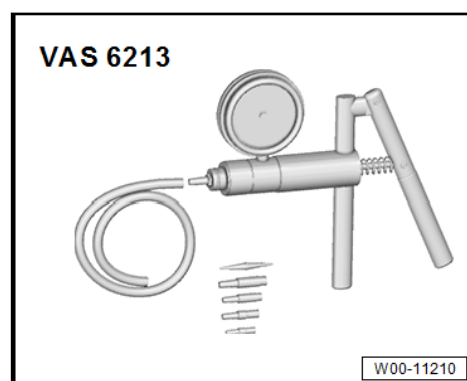
- ◆ Torque Wrench 1783 - 2-10Nm -VAG1783-



- ◆ Double Hexagon Socket - 27mm -VAS5301/7-



- ◆ Hand Vacuum Pump -VAS6213-





## 26 – Exhaust System, Emission Controls

### 1 Exhaust Pipes/Mufflers

⇒ [1.1 Muffler", page 354](#)

⇒ [E1.2 Exhaust Pipe, Removing and Installing", page 357](#)

⇒ [P1.3 Pipes/Mufflers, Disconnecting", page 360](#)

⇒ [S1.4 System, Installing without Tension", page 361](#)

⇒ [S1.5 System, Checking for Leaks", page 363](#)

#### 1.1 Overview - Muffler



### 1 - Heated Oxygen Sensor - G39-

- ☐ 55 Nm
- ☐ Bank 1, sensor 1
- ☐ Only coat the thread with hot bolt paste. Refer to the Parts Catalog
- ☐ Make sure the hot bolt paste does not get into the slits in the sensor body.

### 2 - Front Exhaust Pipe with Catalytic Converter

- ☐ Protect catalytic converter from shocks and impact stress
- ☐ Removing and installing. Refer to [E1.2 Exhaust Pipe, Removing and Installing](#), page 357.
- ☐ Exhaust system, aligning free of tension. Refer to [S1.4 System, Installing without Tension](#), page 361.
- ☐ Exhaust system, checking for leaks. Refer to [S1.5 System, Checking for Leaks](#), page 363.

### 3 - Heated Oxygen Sensor

- ☐ 55 Nm
- ☐ Only coat the thread with hot bolt paste. Refer to the Parts Catalog
- ☐ Make sure the hot bolt paste does not get into the slits in the sensor body.

Only on engine code CBFA

- ☐ Heated Oxygen Sensor 2 -G108-
- ☐ Bank 1, sensor 2

### 4 - Oxygen Sensor After Three Way Catalytic Converter -G130-

- ☐ 55 Nm
- ☐ Only coat the thread with hot bolt paste. Refer to the Parts Catalog
- ☐ Make sure the hot bolt paste does not get into the slits in the sensor body.

Engine code CBFA:

- ☐ Bank 1, Sensor 3

Engine codes CCTA:

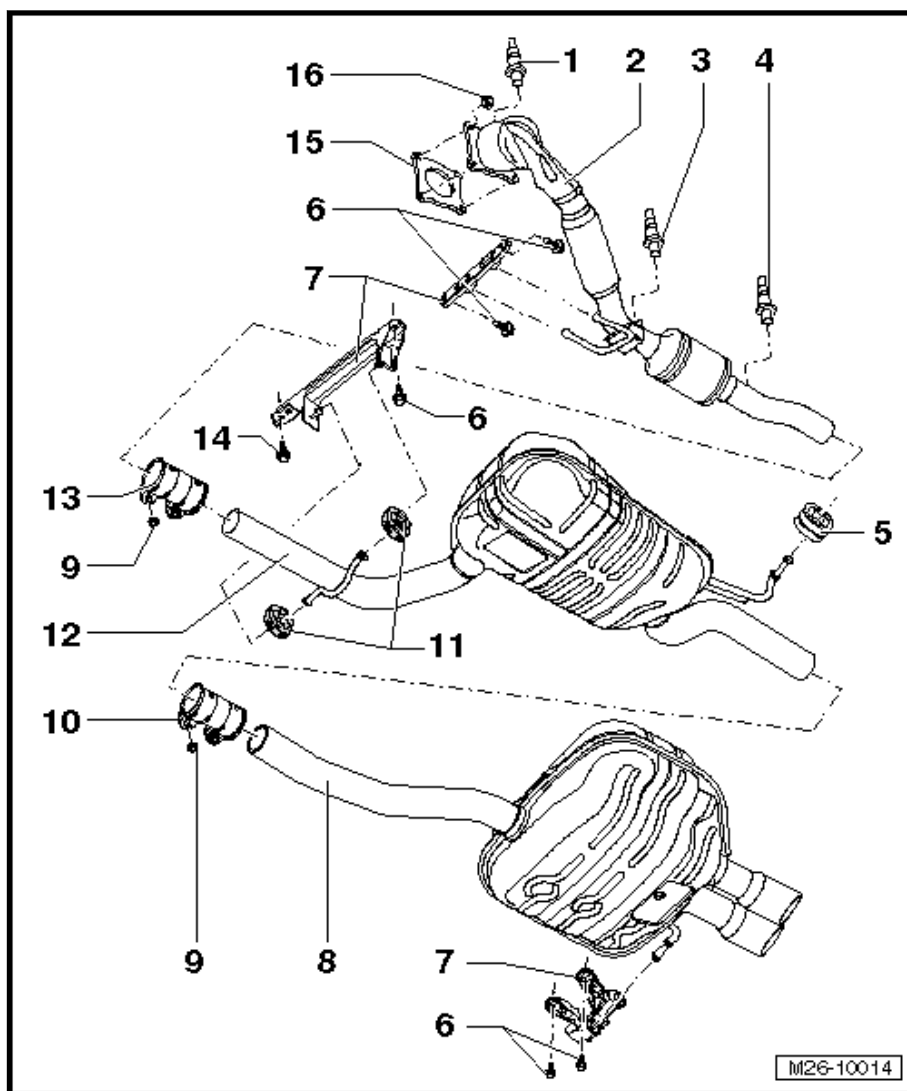
- ☐ Bank 1, sensor 2

### 5 - Retaining Loop

- ☐ Replace if damaged
- ☐ Follow the parts number

### 6 - Bolt

- ☐ 23 Nm





## 7 - Mount

- ☐ Replace if damaged

## 8 - Rear Muffler

- ☐ In original equipment as one unit with front muffler. If a repair is required replace each separately
- ☐ Exhaust system, separating and connecting. Refer to [⇒ P1.3 ipes/Mufflers, Disconnecting", page 360](#) .
- ☐ Exhaust system, aligning free of tension. Refer to [⇒ S1.4 ystem, Installing without Tension", page 361](#) .
- ☐ Exhaust system, checking for leaks. Refer to [⇒ S1.5 ystem, Checking for Leaks", page 363](#) .

## 9 - Nut

- ☐ 23 Nm

## 10 - Rear Clamping Sleeve

- ☐ For individual replacement of front and rear mufflers
- ☐ Note the installation position. Refer to [⇒ Fig. ""Clamping Sleeve Installation Position"" , page 356](#) .
- ☐ Tighten the bolted connections evenly

## 11 - Retaining Loop

- ☐ Replace if damaged
- ☐ Follow the parts number

## 12 - Front Muffler

- ☐ Original equipment as one unit with the rear muffler. If a repair is required replace each separately
- ☐ Exhaust System, Separating and Connecting. Refer to [⇒ P1.3 ipes/Mufflers, Disconnecting", page 360](#) .
- ☐ Exhaust System, Aligning Free of Tension. Refer to [⇒ S1.4 ystem, Installing without Tension", page 361](#) .
- ☐ Exhaust System, Checking for Leaks. Refer to [⇒ S1.5 ystem, Checking for Leaks", page 363](#) .

## 13 - Front Clamping Sleeve

- ☐ Before tightening, adjust the exhaust system when it is cold so that it is free of tension. Refer to [⇒ S1.4 ystem, Installing without Tension", page 361](#) .
- ☐ Note the installation position. Refer to [⇒ Fig. ""Clamping Sleeve Installation Position"" , page 356](#) .
- ☐ Tighten the bolted connections evenly

## 14 - Bolt

- ☐ 26 Nm
- ☐ Replace after removing
- ☐ For attaching the fuel tank

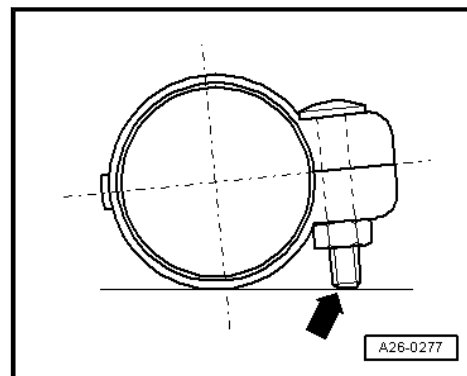
## 15 - Seal

- ☐ Replace after removing

## 16 - Nut

- ☐ 40 Nm
- ☐ Replace after removing
- ☐ Coat the stud bolts on the exhaust manifold with hot bolt paste.; hot bolt paste. Refer to the Parts Catalog.

## Clamping Sleeve Installation Position



- Install clamping sleeve so that bolt end does not project beyond lower edge of clamping sleeve -arrow-.
- Threaded connection points toward the right.

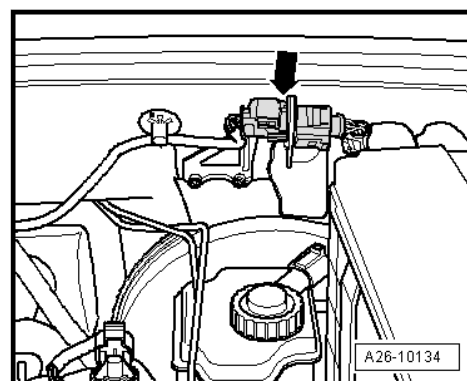
## 1.2 Front Exhaust Pipe, Removing and Installing

### Special tools and workshop equipment required

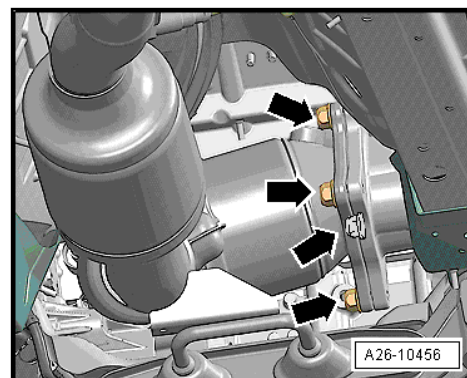
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-
- ◆ Hot Bolt Paste. Refer to the Parts Catalog.

### Removing

- Disconnect the connector for the Heated Oxygen Sensor -G39- -arrow- and free up the wiring harness.



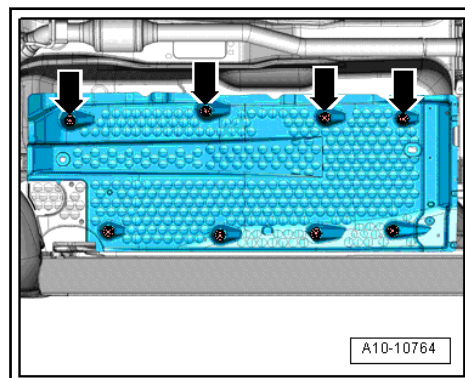
- From the top, remove the nuts -arrows- on the connection of the front exhaust pipe to the turbocharger.



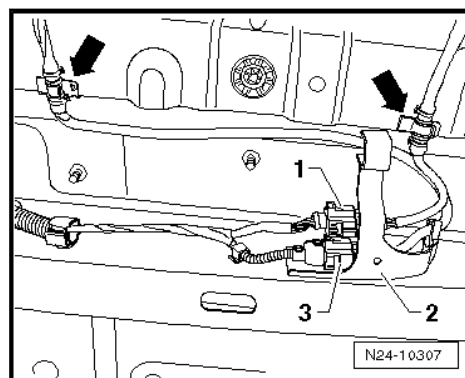
- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50; Noise Insulation.



- Remove nuts accessible from below from front exhaust pipe to the turbocharger connection.
- Remove the nuts -arrows- and slightly pull the underbody cover downward.

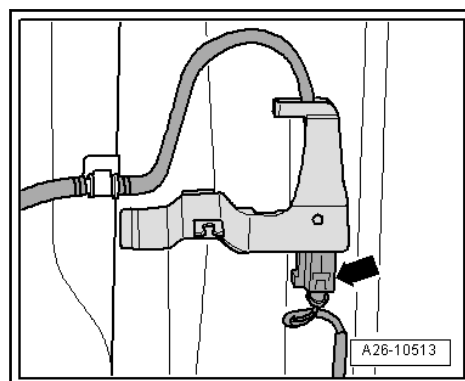


### Engine Code CBFA



- Unclip the lines -arrows- and remove the bracket -2-. Disconnect the connectors -1 and 3-.

### Engine Code CCTA

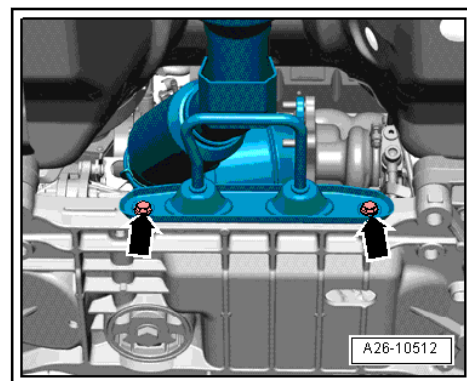


- Disconnect the connector -arrow- on the underbody.
- Remove the connector out of the bracket and free up the wire to the oxygen sensor.

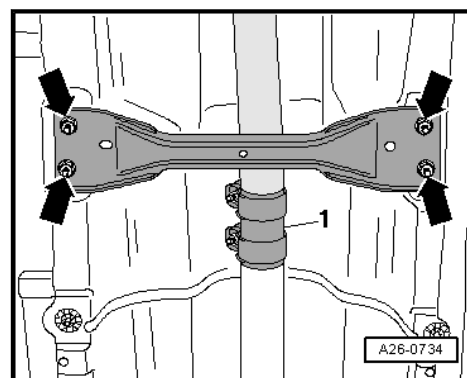




## Continuation for All Engine Codes



- Remove exhaust system suspended mounting -arrows-.
- Remove the front tunnel brace for the underbody -arrows-.

**Note**

- ◆ Do not bend the decoupling element more than 10°.
- ◆ Do not stretch the decoupling element.
- ◆ Do not damage the wire mesh on the decoupling element.
- Loosen the clamping sleeve -1- and push it rearward.
- Remove front exhaust pipe with catalytic converter.

**Installing**

Install in reverse order of removal. Note the following:

- ◆ Replace the seals and self-locking nuts.
- ◆ Coat the stud bolts on the exhaust manifold with hot bolt paste; hot bolt paste. Refer to the Parts Catalog.
- ◆ Align the exhaust system free of stress. Refer to [⇒ S1.4 system, Installing without Tension](#), page 361 .
- ◆ Exhaust system, checking for leaks. Refer to [⇒ S1.5 system, Checking for Leaks](#), page 363 .

**Tightening Specification**

- ◆ Refer to [⇒ -1.1 Muffler](#), page 354

| Bolts                      | Tightening Specification |
|----------------------------|--------------------------|
| Tunnel bridge to underbody | 20 Nm                    |



## 1.3 Exhaust Pipes/Mufflers, Disconnecting

### Special tools and workshop equipment required

- ◆ Pneumatic Body Saw -VAS6780- or
- ◆ Chain Pipe Cutter -VAS6254-
- ◆ Torque Wrench 1331 5-50Nm -VAG1331- (not illustrated)
- ◆ Protective Eyewear
- ◆ Protective clothing



#### Note

- ◆ *A separating point has been provided in the connecting pipe for removing, installing and replacing the front and rear muffler.*
- ◆ *The separating point is marked by depressions around the circumference of the exhaust pipe.*

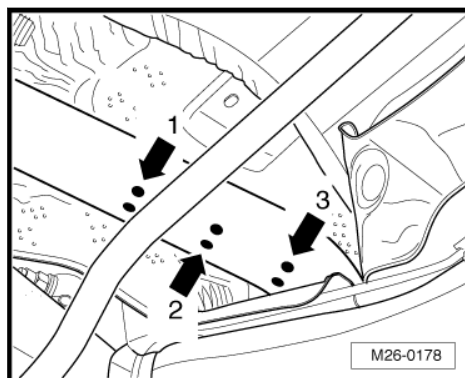
### Separating



#### Note

*To prevent injuries from metal shavings, wear protective goggles and protective clothing.*

- Cut the exhaust pipe at a right angle at the separating point -arrow 2-, for example using a Pneumatic Body Saw -VAS6780- or Chain Pipe Cutter - VAS6254-.



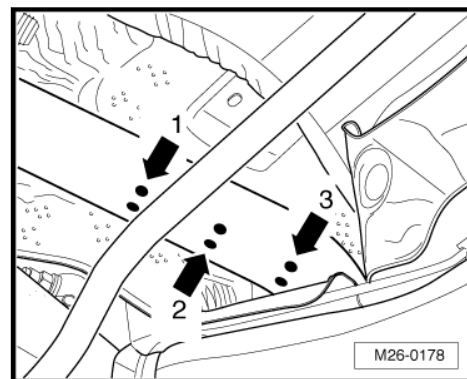
### Joining



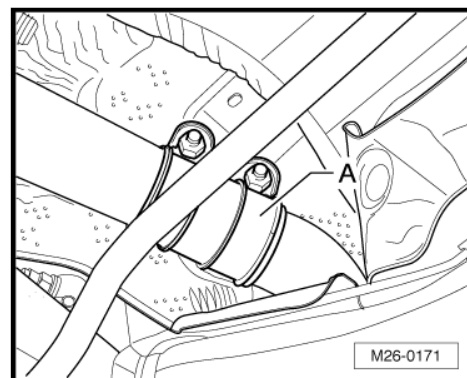
#### Note

*A second technician is needed when tightening the rear clamping sleeve (clamping sleeve repair).*

- Secure the front muffler in the mounts. The front clamp remains loosely connected to pipes.
- Align the rear muffler horizontally and hold it in this position.
- Position the rear clamping sleeve at the side markings -arrow 1 and arrow 3-.



- Turn the rear clamping sleeve -A- as shown and tighten.



- Align the exhaust system free of tension. Refer to [⇒ S1.4 system, Installing without Tension](#), page 361.

#### Tightening Specification

- ◆ Refer to [⇒ -1.1 Muffler](#), page 354

## 1.4 Exhaust System, Installing without Tension

#### Special tools and workshop equipment required

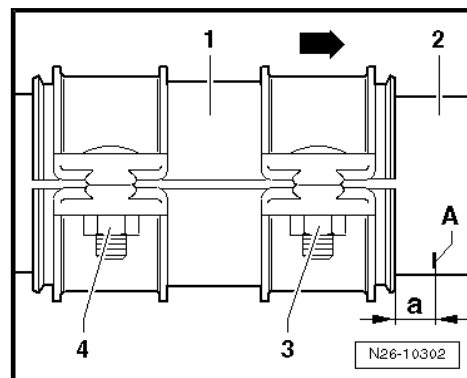
- ◆ Torque Wrench 1331 5-50Nm -VAG1331-

#### Conditions

- Align the exhaust system when it is cold.

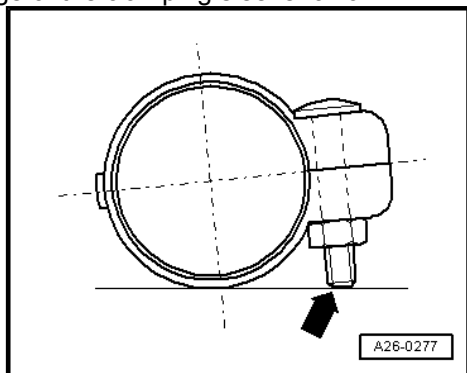
#### Procedure

- Loosen the connections -3 and 4- on the front clamping sleeve -1-.

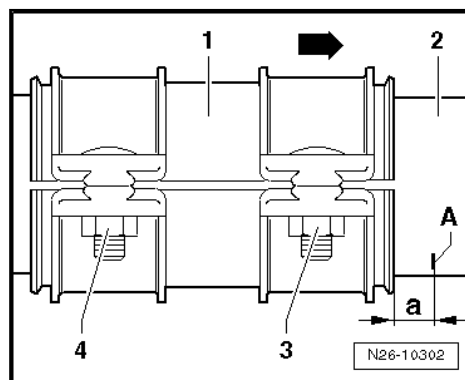




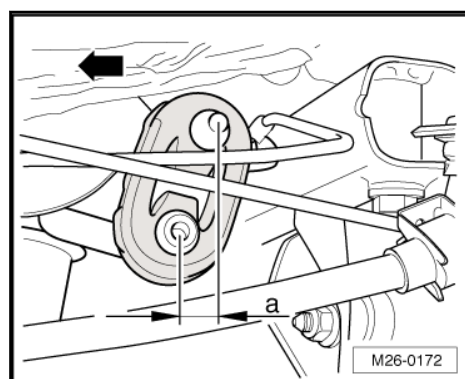
- Align the front clamping sleeve -1- to marking -A- on the front exhaust pipe -2- (-arrow- faces in direction of travel).
- Dimension -a- = 5 mm
- The connections must be at the right and must not project beyond the lower edge of the clamping sleeve -arrow-.



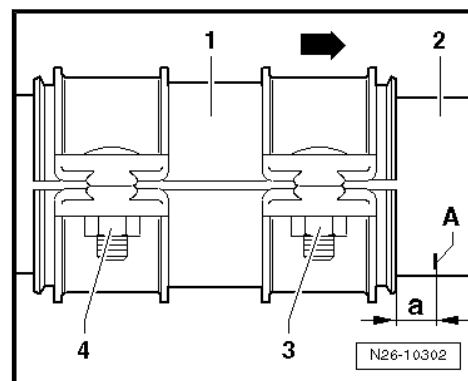
- Hand tighten the front connection -3- on the clamping sleeve.



- Push the exhaust system as far forward until the dimension -a- on the outer retaining loop of the front muffler is 9 to 11 mm. The -arrow- points in the direction of travel.

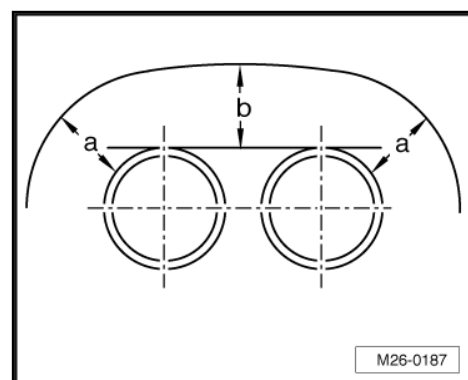


- Tighten the front clamping sleeve bolts -3 and 4- evenly in this position.



### Tail Pipe, Aligning

- Align the rear muffler so distance -a- between the bumper opening and right and left tail pipes is equal.



Likewise, the distance -b- from the bumper opening to the tail pipe must be parallel.

- If necessary, loosen the rear muffler mounting to align the tail pipe.

### Tightening Specification

- ◆ Refer to [⇒ -1.1 Muffler", page 354](#)

## 1.5 Exhaust System, Checking for Leaks

### Test Sequence

- Start the engine and let it run in idle.
- Seal the tail pipe for the duration of the leak test with cloth or a plug, for example.
- Check for leaks by listening at connection areas of cylinder head/exhaust manifold, exhaust manifold/front exhaust pipe etc.
- Repair the determined leaks.



## 2 Secondary Air System

⇒ [2.1 Secondary Air Injection System", page 364](#)

⇒ [S2.2 econdary Air Injection Pump Motor V101, Removing and Installing", page 364](#)

⇒ [S2.3 econdary Air Injection Solenoid Valve N112, Removing and Installing", page 365](#)

### 2.1 Overview - Secondary Air Injection System

#### 1 - Seal

- ☐ Replace after removing

#### 2 - Secondary Air Injection Solenoid Valve -N112-

- ☐ Removing and installing. Refer to ⇒ [S2.3 econdary Air Injection Solenoid Valve N112, Removing and Installing", page 365](#) .

#### 3 - Bolt

- ☐ 9 Nm

#### 4 - Secondary Air Injection Sensor 1 -G609-

#### 5 - O-Ring

- ☐ No replacement part
- ☐ If damaged, replace the Secondary Air Injection Sensor 1 -G609-

#### 6 - To Air Filter Upper Section

#### 7 - Secondary Air Guide

- ☐ Check for secure fit

#### 8 - Routing Aid for the Air Filter Drain Line

#### 9 - Nut

- ☐ 9 Nm

#### 10 - Bracket

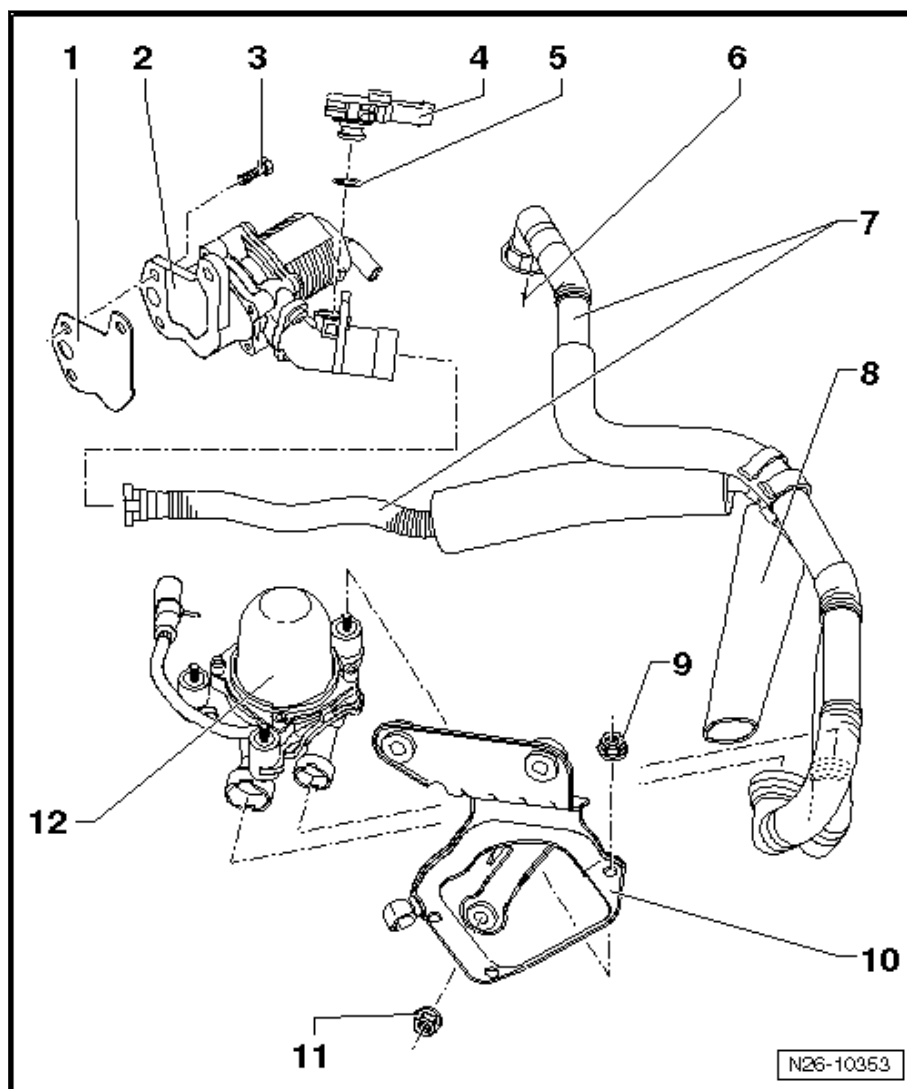
- ☐ For Secondary Air Injection Pump Motor - V101-

#### 11 - Nut

- ☐ 25 Nm

#### 12 - Secondary Air Injection Pump Motor -V101-

- ☐ Removing and installing. Refer to ⇒ [S2.2 econdary Air Injection Pump Motor V101, Removing and Installing", page 364](#) .



### 2.2 Secondary Air Injection Pump Motor - V101-, Removing and Installing

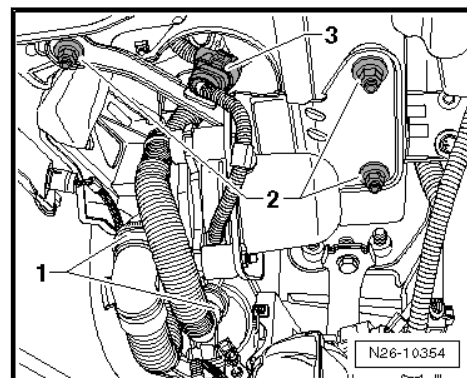
Special tools and workshop equipment required

- ◆ Torque Wrench 1331 5-50Nm -VAG1331-



## Removing

- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 50; Noise Insulation.
- Remove the left front wheel.
- Remove the left front wheel housing liner. Refer to ⇒ Body Exterior; Rep. Gr. 66; Wheel Housing Liner; Front Wheel Housing Liner, Removing and Installing.
- Loosen the lines -1-. Remove the nuts -2-, disconnect the connector -3- and remove the Secondary Air Injection Pump Motor -V101-.



### Note

*Press the securing ring to disengage the lines.*

## Installing

Install in reverse order of removal.

## Tightening Specification

- ◆ Refer to ⇒ [-2.1 Secondary Air Injection System-, page 364](#)

## 2.3 Secondary Air Injection Solenoid Valve -N112-, Removing and Installing

### Special tools and workshop equipment required

- ◆ Torque Wrench 1331 5-50Nm -VAG1331-

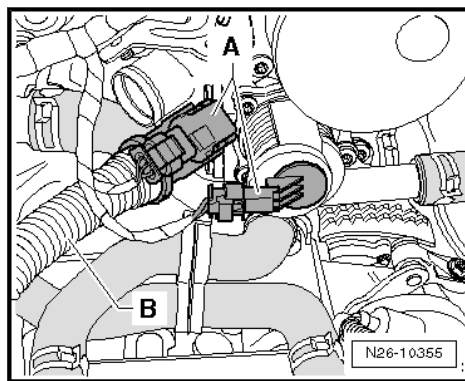
## Removing



### Note

*The battery ground cable must be disconnected for the following procedure. Check beforehand if a coded radio is installed. Request the anti-theft code if necessary.*

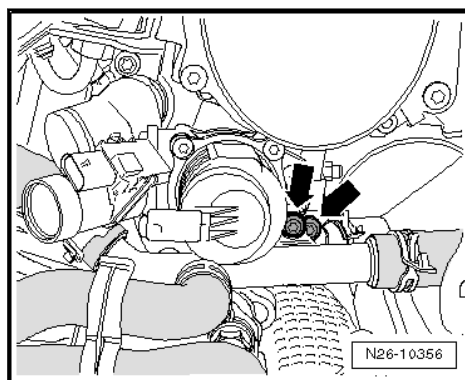
- Remove the engine cover. Refer to ⇒ [C3.1 over, Removing and Installing-, page 37](#) .
- Remove the air filter. Refer to ⇒ [F3.2 filter Housing, Removing and Installing-, page 312](#) .
- Remove the battery and the battery tray. Refer to ⇒ Electrical Equipment; Rep. Gr. 27; Battery; Battery Tray, Removing and Installing.
- Remove the connector -A- and line -B- from the Secondary Air Injection Solenoid Valve -N112-.



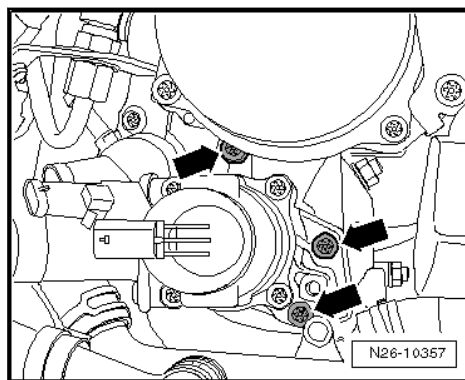
#### Note

*Press the securing ring to disengage the line.*

- Loosen the coolant pipe by removing the bolts -arrows-.



- Remove the bolts -arrows- and remove the Secondary Air Injection Solenoid Valve -N112-.



#### Installing

Install in reverse order of removal. Note the following:

- Replace the seal.
- Pay attention to the information after connecting the Battery. Refer to ⇒ [Electrical Equipment; Rep. Gr. 27; Battery; Battery, Disconnecting and Connecting.](#)

#### Tightening Specification

- ♦ Refer to ⇒ [-2.1 Secondary Air Injection System-, page 364](#)
- ♦ Refer to ⇒ [-3.1 Coolant Pipes-, page 249](#)

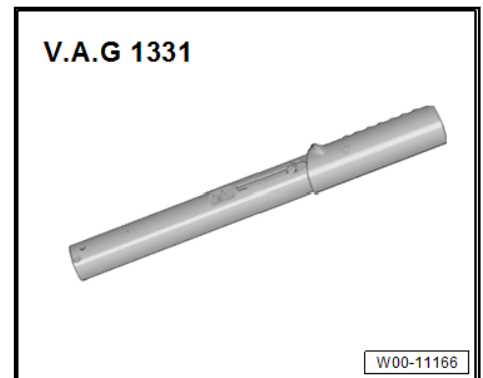




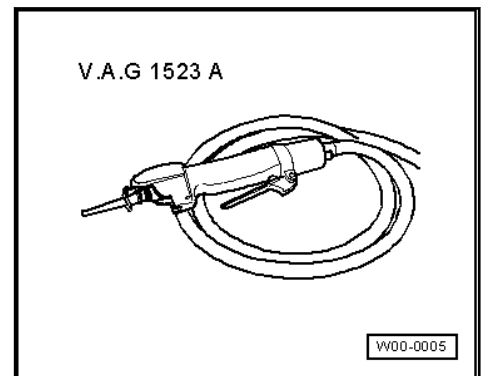
### 3 Special Tools

#### Special tools and workshop equipment required

- ◆ Torque Wrench 1331 5-50Nm -VAG1331-



- ◆ Pneumatic Body Saw -VAS6780- or



- ◆ Chain Pipe Cutter -VAS6254-





## 28 – Ignition/Glow Plug System

### 1 Ignition System

⇒ [-1.1 Ignition System", page 368](#)

⇒ [D1.2 ata and Spark Plugs", page 370](#)

⇒ [C1.3 oils with Power Output Stages, Removing and Installing", page 371](#)

⇒ [K1.4 nock Sensor 1 G61, Removing and Installing", page 373](#)

⇒ [E1.5 ngine Speed Sensor G28, Removing and Installing", page 374](#)

#### 1.1 Overview - Ignition System

**1 - Knock Sensor 1 -G61-**

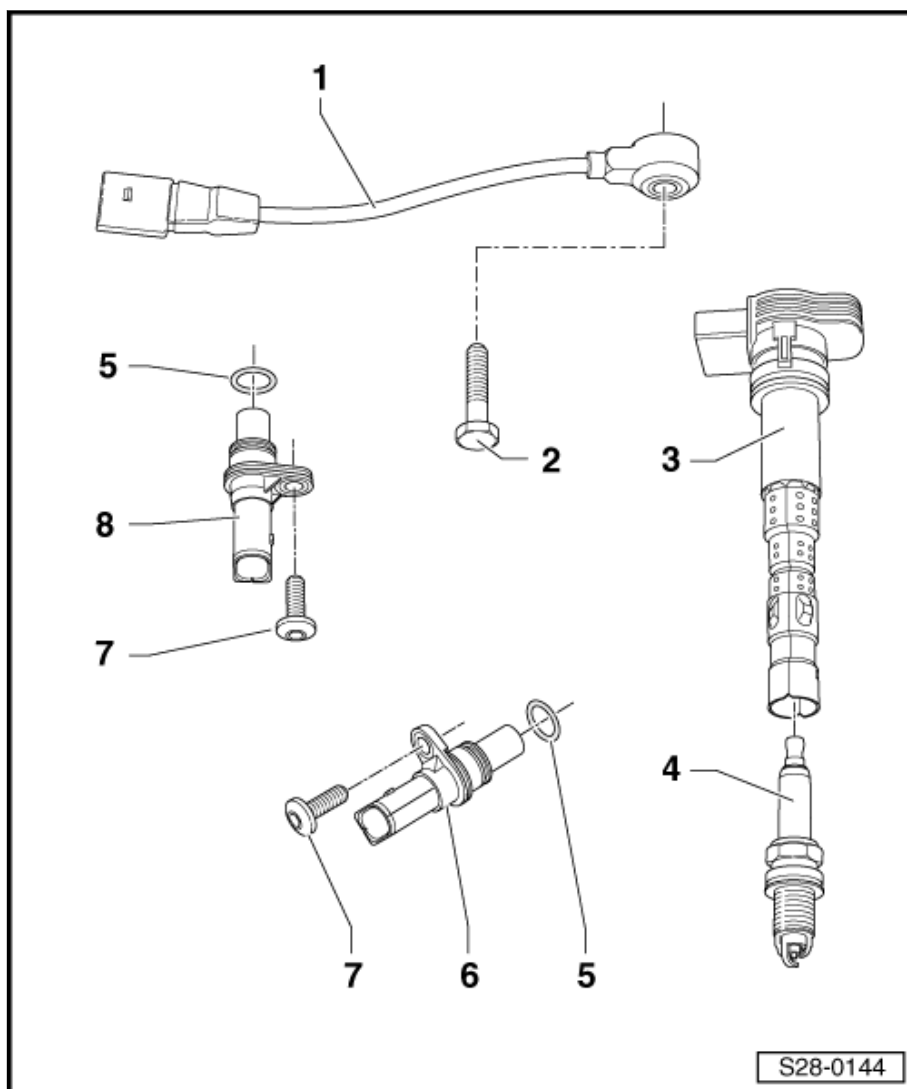
- ☐ On the front cylinder head under the intake manifold
- ☐ Contacts gold plated
- ☐ Connectors. Refer to [⇒ Fig. “Connectors”, page 370](#).
- ☐ Removing and installing. Refer to [⇒ K1.4 Knock Sensor 1 G61, Removing and Installing”, page 373](#).

**2 - Bolt**

- ☐ 22 Nm
- ☐ Tightening specifications affect the Knock Sensor function.

**3 - Ignition Coil with Power Output Stage**

- ☐ Ignition Coil 1 with Power Output Stage - N70-
- ☐ Ignition Coil 2 with Power Output Stage - N127-
- ☐ Ignition Coil 3 with Power Output Stage - N291-
- ☐ Ignition Coil 4 with Power Output Stage - N292-
- ☐ Removing and installing. Refer to [⇒ C1.3 Coils with Power Output Stages, Removing and Installing”, page 371](#).

**4 - Spark Plug**

- ☐ 25 Nm
- ☐ If the spark plug is being replaced, grease the ignition coil with power output stage. Refer to [⇒ page 373](#).
- ☐ Note the change intervals. Refer to [⇒ Maintenance Intervals; Rep. Gr. 03](#).
- ☐ Type and electrode gap. Refer to [⇒ D1.2 Air and Spark Plugs”, page 370](#).
- ☐ Remove and install with Spark Plug Removal Tool -3122B-.

**5 - O-Ring**

- ☐ No replacement part
- ☐ Replace if damaged.

**6 - Engine Speed Sensor -G28-**

- ☐ On the front lower left side of the cylinder block, next to the oil separator [⇒ Fig. “Engine Speed Sensor -G28- -1-”, page 370](#)
- ☐ Removing and installing. Refer to [⇒ E1.5 Engine Speed Sensor G28, Removing and Installing”, page 374](#).

**7 - Bolt**

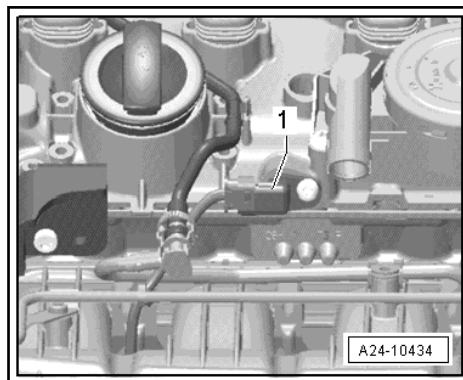
- ☐ 9 Nm

**8 - Camshaft Position Sensor -G40-**

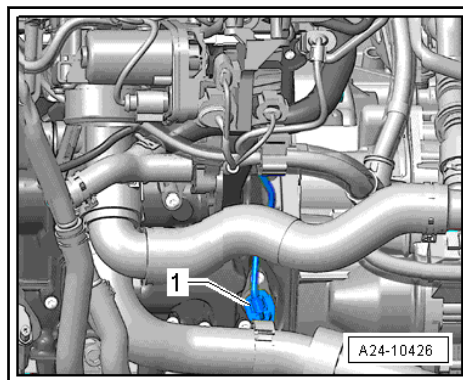


- ❑ Bolted on the front cylinder head cover ⇒ Fig. [“Camshaft Position Sensor -G40- -1-”](#), page 370
- ❑ Connectors. Refer to ⇒ Fig. [“Connectors”](#), page 370 .

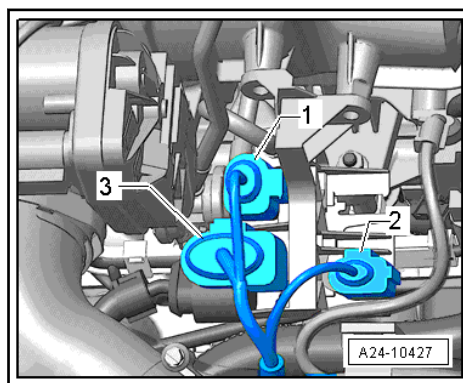
### Camshaft Position Sensor -G40- -1-



### Engine Speed Sensor -G28- -1-



### Connectors



- 1 - From Camshaft Position Sensor -G40-
- 2 - From Knock Sensor 1 -G61-
- 3 - 8-Pin Connector for Fuel Injectors

## 1.2 Test Data and Spark Plugs

| Engine Codes              | CBFA and CCTA |
|---------------------------|---------------|
| Ignition sequence         | 1-3-4-2       |
| Spark Plugs <sup>3)</sup> |               |
| ◆ VW/Audi                 | 101 905 631 H |



| Engine Codes               | CBFA and CCTA                                  |
|----------------------------|--|
| ◆ Electrode gap            | 1.0 to 1.1 mm                                  |
| ◆ Tightening Specification | -item 4- ➔ <a href="#">Item 4 (page 369)</a>   |
| ◆ Observe change interval  | Refer to ➔ Maintenance Intervals; Rep. Gr. 03. |

3) Remove and install with Spark Plug Removal Tool -3122B-

### 1.3 Ignition Coils with Power Output Stages, Removing and Installing

#### Special tools and workshop equipment required

- ◆ Puller - Ignition Coil -T40039-
- ◆ Lubricating Paste -G 052 141 A2-
- ◆ The Engine Control Module is equipped with OBD. Before repairs and fault finding, check the DTC memory first. Refer to Vehicle Diagnostic Tester "Guided Function".
- ◆ For proper function of the electrical components, a voltage of at least 12.0 V is required.
- ◆ To complete the procedure, check the Engine Control Module DTC memory and erase all DTC entries that may have been stored when testing and making repairs. If the DTC memory was erased, the readiness code must be regenerated using the Vehicle Diagnostic Tester in "Guided Functions".
- ◆ If the engine only starts briefly and then turns off again after Fault Finding, repairs or checking the components, it may be that the immobilizer is blocking the Engine Control Module. The control module must then be adapted if necessary using the Vehicle Diagnostic Tester in "Guided Functions".

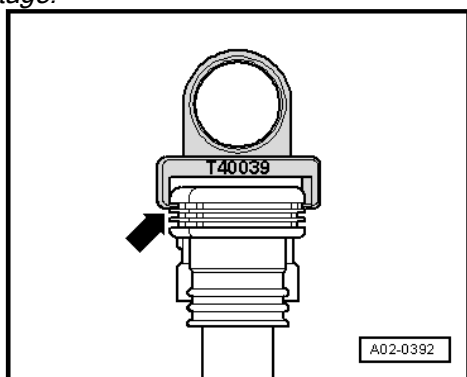


## Removing



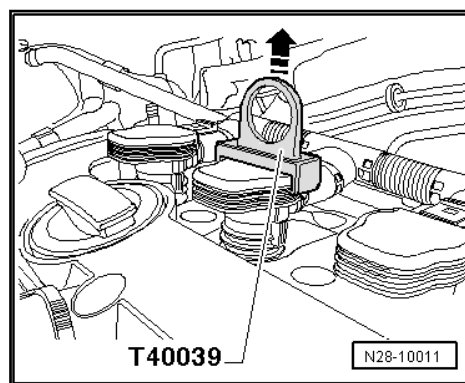
### Note

- ♦ Follow all safety precautions. Refer to ⇒ [P1 recautions](#), [page 1](#).
- ♦ Note the general information on the ignition system. Refer to ⇒ [P1.4 recautions when Working on Ignition System](#), [page 2](#).
- ♦ Overview - ignition system. Refer to ⇒ [-1.1 Ignition System](#), [page 368](#).
- ♦ To remove the Spark Plugs, place the Puller - Ignition Coil - T40039- at the topmost thick rib -arrow- of the Ignition Coil with Power Output Stage.

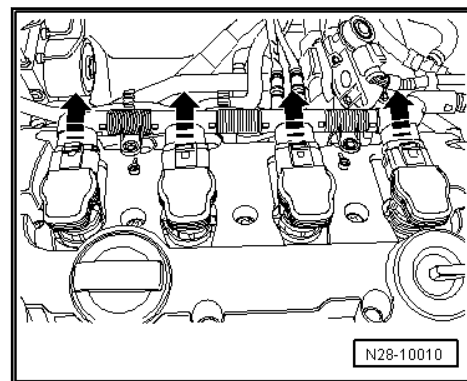


The lower ribs may be damaged if they are used.

- Remove the engine cover. Refer to ⇒ [C3.1 over, Removing and Installing](#), [page 37](#).
- Pull all ignition coils approximately 30 mm out of spark plug shaft in direction of -arrow- using the Puller - Ignition Coil -T40039-.

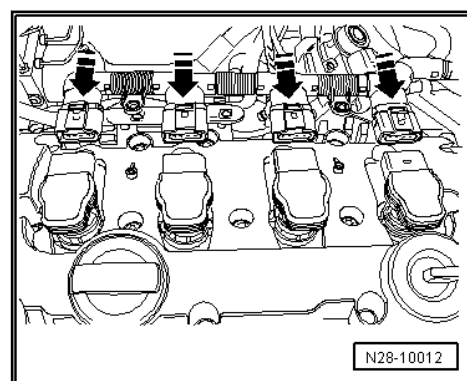


- Disconnect the connectors in direction of -arrows- from the Ignition Coils with Power Output Stages.



#### Ignition Coils with Power Output Stages, Installing:

- Insert all Ignition Coils loosely into the spark plug shaft.
- Align the Ignition Coils to the connectors in direction of -arrows- and connect all of the connectors to the Ignition Coils at the same time.



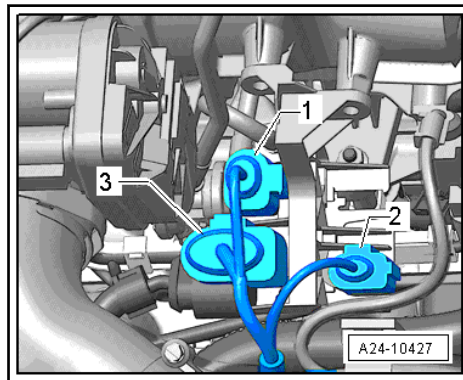
- Press the Ignition Coils evenly onto the Spark Plugs by hand.

### 1.4 Knock Sensor 1 -G61-, Removing and Installing

- ◆ The Engine Control Module is equipped with OBD. Before repairs and fault finding, check the DTC memory first. Refer to Vehicle Diagnostic Tester "Guided Function".
- ◆ For proper function of the electrical components, a voltage of at least 12.0 V is required.
- ◆ To complete the procedure, check the Engine Control Module DTC memory and erase all DTC entries that may have been stored when testing and making repairs. If the DTC memory was erased, the readiness code must be regenerated using the Vehicle Diagnostic Tester in "Guided Functions".
- ◆ If the engine only starts briefly and then turns off again after Fault Finding, repairs or checking the components, it may be that the immobilizer is blocking the Engine Control Module. The control module must then be adapted if necessary using the Vehicle Diagnostic Tester in "Guided Functions".

#### Removing

- Remove the connector -2- from Knock Sensor 1 -G61-.



- Remove the coolant pump. Refer to [⇒ P2.4 ump, Removing and Installing](#), page 235 .



#### Note

*The Knock Sensor 1 -G61- is located below the intake manifold behind the coolant pump.*

- Remove Knock Sensor 1 -G61-.

#### Installing

Install in reverse order of removal and note the following:

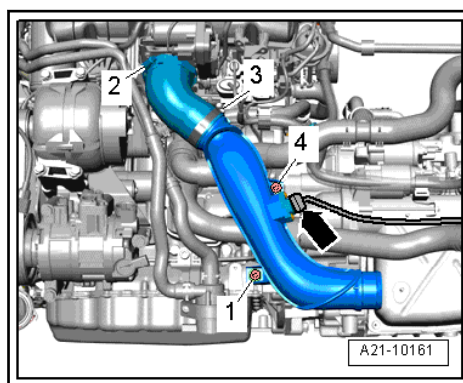
#### Tightening Specification

- ♦ Refer to [⇒ -1.1 Ignition System](#), page 368

## 1.5 Engine Speed Sensor -G28-, Removing and Installing

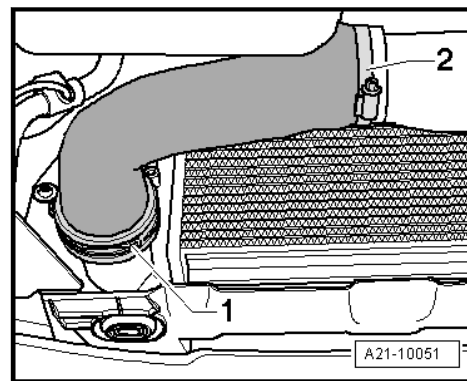
#### Removing

- Remove the engine cover. Refer to [⇒ C3.1 over, Removing and Installing](#), page 37 .
- Open the air duct pipe hose clamp -2-.

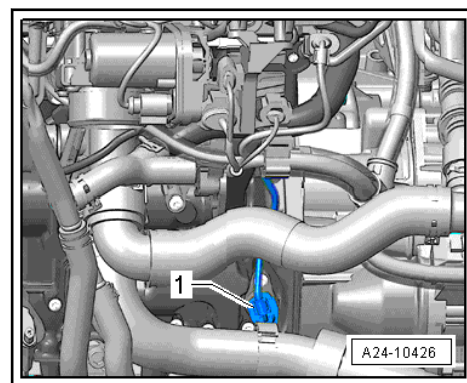


- Disconnect the connector -arrow-.
- Remove the noise insulation. Refer to [⇒ Body Exterior; Rep. Gr. 50; Noise Insulation](#).
- Remove the bolts -1 and 4-. Remove the air duct hose downward from the Throttle Valve Control Module -J338-.
- Remove the air duct hose -1- from the charge air cooler and remove the air duct pipe downward.





- Disconnect the connector -1- from the Engine Speed Sensor -G28-.



- Remove the bolt for the Engine Speed Sensor -G28-.

### Installing

Install in reverse order of removal and note the following:

### Tightening Specification

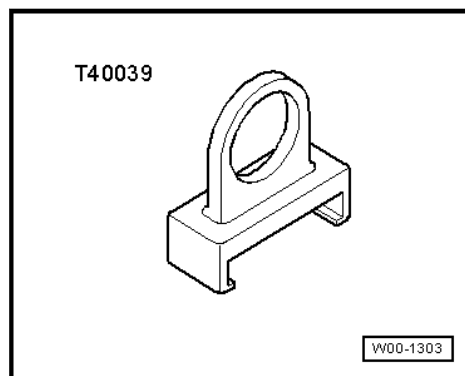
- ◆ Refer to [⇒ -2.2 Charge Air System", page 283](#)
- ◆ Refer to [⇒ -1.1 Ignition System", page 368](#)



## 2 Special Tools

### Special tools and workshop equipment required

- ◆ Puller - Ignition Coil -T40039-





### 3 Revision History

DRUCK NUMBER: K0059072821

| Factory Edition | Edit Edition | Job Type       | Feedback  | Notes  | Quality Checked By |
|-----------------|--------------|----------------|-----------|--|--------------------|
| 11.2 018        | 03/10/2019   | Correction     | N/A       | Fuel System Warning  | Joe Y              |
| 11.2 018        | 03/01/2019   | Factory Update | N/A       |  | Eric P.            |
| 06.2 017        | 10/19/2017   | Correction     | N/A       | Updated the special tools in the sealing flange transmission side procedure  | Eric P.            |
| 06.2 017        | 10/03/2017   | Correction     | N/A       | Added notice (When replacing the coolant pump, ensure the seal, sealing surface and surrounding engine area are free from oils that may contaminate the seal and cause a repeat concern.) to Coolant pump R&I. | Eric P.            |
| 06.2 017        | 07/10/2017   | Local Feedback | 126 183 2 | Updated Camshaft Timing Chain, R&I   | Eric P.            |
| 02.2 015        | 11/02/2016   | Local Feedback | 121 099 6 | In Coolant Pump R & I, added "support" to intake manifold in the 5th step.   | Eric P.            |
| 02.2 015        | 06/25/2015   | Correction     | N/A       | Fixed linking issues   | Eric P.            |
| 02.2 015        | 06/9/2015    |                | N/A       | Reformat   | Jim H              |
|                 | 03/31/2015   | Local Feedback | 109 007 2 |  | Eric P             |
|                 | 02/05/2015   | Factory Update | N/A       |  | Eric P             |

# Cautions & Warnings

**Please read these WARNINGS and CAUTIONS before proceeding with maintenance and repair work. You must answer that you have read and you understand these WARNINGS and CAUTIONS before you will be allowed to view this information.**

- If you lack the skills, tools and equipment, or a suitable workshop for any procedure described in this manual, we suggest you leave such repairs to an authorized Volkswagen retailer or other qualified shop. We especially urge you to consult an authorized Volkswagen retailer before beginning repairs on any vehicle that may still be covered wholly or in part by any of the extensive warranties issued by Volkswagen.
- Disconnect the battery negative terminal (ground strap) whenever you work on the fuel system or the electrical system. Do not smoke or work near heaters or other fire hazards. Keep an approved fire extinguisher handy.
- Volkswagen is constantly improving its vehicles and sometimes these changes, both in parts and specifications, are made applicable to earlier models. Therefore, part numbers listed in this manual are for reference only. Always check with your authorized Volkswagen retailer parts department for the latest information.
- Any time the battery has been disconnected on an automatic transmission vehicle, it will be necessary to reestablish Transmission Control Module (TCM) basic settings using the Volkswagen Factory Approved Scan Tool (ST).
- Never work under a lifted vehicle unless it is solidly supported on stands designed for the purpose. Do not support a vehicle on cinder blocks, hollow tiles or other props that may crumble under continuous load. Never work under a vehicle that is supported solely by a jack. Never work under the vehicle while the engine is running.
- For vehicles equipped with an anti-theft radio, be sure of the correct radio activation code before disconnecting the battery or removing the radio. If the wrong code is entered when the power is restored, the radio may lock up and become inoperable, even if the correct code is used in a later attempt.
- If you are going to work under a vehicle on the ground, make sure that the ground is level. Block the wheels to keep the vehicle from rolling. Disconnect the battery negative terminal (ground strap) to prevent others from starting the vehicle while you are under it
- Do not attempt to work on your vehicle if you do not feel well. You increase the danger of injury to yourself and others if you are tired, upset or have taken medicine or any other substances that may impair you or keep you from being fully alert.
- Never run the engine unless the work area is well ventilated. Carbon monoxide (CO) kills.
- Always observe good workshop practices. Wear goggles when you operate machine tools or work with acid. Wear goggles, gloves and other protective clothing whenever the job requires working with harmful substances.
- Tie long hair behind your head. Do not wear a necktie, a scarf, loose clothing, or a necklace when you work near machine tools or running engines. If your hair, clothing, or jewelry were to get caught in the machinery, severe injury could result.
- Do not re-use any fasteners that are worn or deformed in normal use. Some fasteners are designed to be used only once and are unreliable and may fail if used a second time. This includes, but is not limited to, nuts, bolts, washers, circlips and cotter pins. Always follow the recommendations in this manual - replace these fasteners with new parts where indicated, and any other time it is deemed necessary by inspection.

# Cautions & Warnings

- Illuminate the work area adequately but safely. Use a portable safety light for working inside or under the vehicle. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.
- Friction materials such as brake pads and clutch discs may contain asbestos fibers. Do not create dust by grinding, sanding, or by cleaning with compressed air. Avoid breathing asbestos fibers and asbestos dust. Breathing asbestos can cause serious diseases such as asbestosis or cancer, and may result in death.
- Finger rings should be removed so that they cannot cause electrical shorts, get caught in running machinery, or be crushed by heavy parts.
- Before starting a job, make certain that you have all the necessary tools and parts on hand. Read all the instructions thoroughly; do not attempt shortcuts. Use tools that are appropriate to the work and use only replacement parts meeting Volkswagen specifications. Makeshift tools, parts and procedures will not make good repairs.
- Catch draining fuel, oil or brake fluid in suitable containers. Do not use empty food or beverage containers that might mislead someone into drinking from them. Store flammable fluids away from fire hazards. Wipe up spills at once, but do not store the oily rags, which can ignite and burn spontaneously.
- Use pneumatic and electric tools only to loosen threaded parts and fasteners. Never use these tools to tighten fasteners, especially on light alloy parts. Always use a torque wrench to tighten fasteners to the tightening torque listed.
- Keep sparks, lighted matches, and open flame away from the top of the battery. If escaping hydrogen gas is ignited, it will ignite gas trapped in the cells and cause the battery to explode.
- Be mindful of the environment and ecology. Before you drain the crankcase, find out the proper way to dispose of the oil. Do not pour oil onto the ground, down a drain, or into a stream, pond, or lake. Consult local ordinances that govern the disposal of wastes.
- The air-conditioning (A/C) system is filled with a chemical refrigerant that is hazardous. The A/C system should be serviced only by trained automotive service technicians using approved refrigerant recovery/recycling equipment, trained in related safety precautions, and familiar with regulations governing the discharging and disposal of automotive chemical refrigerants.
- Before doing any electrical welding on vehicles equipped with anti-lock brakes (ABS), disconnect the battery negative terminal (ground strap) and the ABS control module connector.
- Do not expose any part of the A/C system to high temperatures such as open flame. Excessive heat will increase system pressure and may cause the system to burst.
- When boost-charging the battery, first remove the fuses for the Engine Control Module (ECM), the Transmission Control Module (TCM), the ABS control module, and the trip computer. In cases where one or more of these components is not separately fused, disconnect the control module connector(s).
- Some of the vehicles covered by this manual are equipped with a supplemental restraint system (SRS), that automatically deploys an airbag in the event of a frontal impact. The airbag is operated by an explosive device. Handled improperly or without adequate safeguards, it can be accidentally activated and cause serious personal injury. To guard against personal injury or airbag system failure, only trained Volkswagen Service technicians should test, disassemble or service the airbag system.

## Cautions & Warnings

- Do not quick-charge the battery (for boost starting) for longer than one minute, and do not exceed 16.5 volts at the battery with the boosting cables attached. Wait at least one minute before boosting the battery a second time.
- Never use a test light to conduct electrical tests of the airbag system. The system must only be tested by trained Volkswagen Service technicians using the Volkswagen Factory Approved Scan Tool (ST) or an approved equivalent. The airbag unit must never be electrically tested while it is not installed in the vehicle.
- Some aerosol tire inflators are highly flammable. Be extremely cautious when repairing a tire that may have been inflated using an aerosol tire inflator. Keep sparks, open flame or other sources of ignition away from the tire repair area. Inflate and deflate the tire at least four times before breaking the bead from the rim. Completely remove the tire from the rim before attempting any repair.
- When driving or riding in an airbag-equipped vehicle, never hold test equipment in your hands or lap while the vehicle is in motion. Objects between you and the airbag can increase the risk of injury in an accident.

**I have read and I understand these Cautions and Warnings.**